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MONTHLY MAGAZINE

In praise of

WEST BENGAL SECRETARIAT
HOME DEPARTMENT

CALCUTTA THE 30th Jany 195 3

O No -

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[illegible signature]

Secretary & Director General,
Transportation, Govt. of West Bengal,

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FORTY FOURTH YEAR OF PUBLICATION

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Contents for MAY ISSUE

May issue of Industry will contain useful articles on industrial subjects such as Pulps for Strawboard; Classification of Glue; Bonding Wood to other Materials and Chromium Plating in addition to the usual features such as Scientific Researches and Inventions; Engineering Notes; The Business World; Official India; Formulas, Processes and Answers; Reader's Business Problems and Queries and Replies.

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PROBLEMS OF AUTOMOBILE INDUSTRY

The Tariff Commission's Report on the automobile industry and the Government's favourable decision thereon have been given a warm welcome by all interested in the development of the industry. It is for the industry now to prove its worth by living up to the hope expressed by the Indian Commerce Minister, Mr. T. T. Krishnamachari, that the country is 'beginning a new chapter.' This by no means suggests that the Indian automobile industry is now free to tread the royal road to success and prosperity. On the contrary, the industry will have to surmount many hurdles before it can reach the goal of progress, if not an all-round one including the capacity to export cars, at least up to the level of self-sufficiency. The Tariff Commission's recommendations, which the Government have accepted, cannot but, however, gear the industry up to its task of marching ahead to success.

The Indian automobile industry is quite a recent one and the difficulties, it is facing, are more or less peculiar to every new industry. Some of the difficulties again are related to the general economic backwardness of the country. Take, for example, the limited demand for cars in the country. That is so only because of the low purchasing power of the people and unless there has been an appreciable rise in the people's standard of living, the industry will continue to be discouraged by the phenomenon of scarce demand for cars. Besides, the problem of becoming economic units has yet to be solved. The industry is more or less confined at present to assembling activities and has to depend on foreign countries for its requirements of parts and spares. The Tariff Commission's recommendations should be studied in the context of the above principal difficulties which, if allowed to remain unliquidated, cannot but retard the proper growth and development of the indigenous automobile industry.

The Commission has not taken its task lightly. In its report every important question relating to the present set-up of the industry has been studied thoroughly well. The Commission has recognised the national importance of the industry and has stated very clearly that unless protection in suitable form is granted to the automobile industry in the present stage of its development and other measures are taken for its encouragement, it cannot be established on a sound basis. The cry for protection has been going up from so many varied types of industries these days that nobody would have been surprised if the Government decided to turn down the automobile industry's demand for it. Fortunately, however, the Government have not done anything of the kind, and both the industry and its well-wishers, therefore, have reacted favourably to the Government's acceptance of the Commission's recommendation.

The Commission has attempted to find out why the demand for cars within the country is so deplorably low. As we have pointed out in a previous paragraph, the low demand for cars is connected with the country's backward nature of economy. But what about the select few who go about in cars which they can afford to own? Why exactly should they not be agreeable to use cars of Indian manufacture? As the Commission sees it, the present high rates of import duty have led to the decreased demand for cars because of their exorbitant prices. Reduction of import duty, therefore, has been recommended in regard to cars and their components. This recommendation has been accepted in a modified form as to rates and this means that our factories may utilize imported components and thereby be in a position to step down the prices of the cars manufactured by them. We are not so sure, however, if the relaxation of duty on imported components alone could be enough to create an increased demand for cars.

The Commission has recommended that the manufacture of cars should be limited to only four types—baby, light, medium and big cars. This recommendation appears to be very important in view of the country's limited demand for cars. In regard to diesel vehicles, the Commission suggests that the manufacture of 5-ton diesel vehicle should be encouraged for the purpose of meeting the demand for heavy transport. The Government, however, takes the view that the diesel vehicle manufactured in India need not be confined to the 5-ton type. Engines for light and medium vehicles too are needed and so the

five firms engaged in the manufacture of automobiles in India should not be directed to confine the manufacture of their diesel vehicle to the 5-ton type *only*.

The tax burden imposed on the motor owners is too heavy and among other things, it too is responsible for the diminishing demand for cars in the country. The Commission has agreed with the Motor Vehicles Taxation Enquiry Committee that the tax burden needs to be lightened. It is heartening to note that the Central Government is prepared to consider this aspect of the matter and to hold consultations with State Governments to decide what to do for relaxing tax burden with a view to stepping up the demand for cars. As things now stand, it is the tax burden on the vehicle which is proving more prohibitive than the outlay on cars.

The Commission seems to have evinced greater interest in the five manufacturers of cars in the country than in the mere assemblers. This is clear from its recommendation, which the Government too has accepted, that the demand for vehicles should be concentrated on the five firms who have got a manufacturing programme. The consideration which has weighed with the Government in arriving at the decision to withdraw the facilities hitherto enjoyed by the assemblers, is supposed to be a necessity. The Government expects them to cease their assembly operations and concentrate on such activities as "the maintenance and servicing of the vehicles on the road." Whatever the justifiability of the decision, one should not forget that the assemblers too have done some yeomen's service to the cause of development of the automobile industry by training personnel in the technical and technological aspects of the industry and by creating car-consciousness among our countrymen.

At the present moment the Indian automobile industry has to depend on foreign countries for the supply of some of the necessary parts and spares. It has now succeeded in manufacturing a larger number of equipments than formerly, but the need to liquidate dependence on their foreign sources of supply is still extant. The Commission has drawn attention to the matter and has urged that the dependence should be ended if the industry has to come into its own. Thus, with the development of the manufacture of cars proper, we have to pay attention to the question of developing the ancilliary industries whose business it is to manufacture car components.

Customers' choice is moulded by several considerations, the chief of which is that relating to prices. It is expected that relaxation of the tax burden and of the import duty in particular, will enable our manufacturers to reduce the price of cars. Servicing facilities should also be made available to the customers on a more ample scale. Thirdly, every attempt should be made to improve quality and as Mr. Krishnamachari points out, the idea of sacrificing quality on the plea of producing something wholly in India should be abandoned. Let us hope, however difficult the task, the Indian automobile industry will not fail to face up to it and do all it can to develop itself adequately by utilizing in the proper manner, the facilities which it has obtained as per the recommendations of the Tariff Commission and the Government's decisions thereon.

FRUIT GROWING

India grows a large number and variety of luscious fruits and can take a very well-justified pride in her orchards which spread all over the country, from north to south and from east to west. But that is no reason why the growers of fruit here should not modernise their method of cultivation. Perhaps, they do not do it because of lack of funds and it is redundant to point out that the responsibility of making them take to the modern method of fruit growing rests mainly on the Government. Yet another reason why our fruit growers abhor modernisation may be their reluctance to change even to the slightest degree their old and antiquated method of caltivation. The Government, therefore, should try to modernise their outlook wherever and whenever necessary. Our business minded enthusiasts may set up fruit co-operatives. Problems of marketing and such technicalities as preservation need to be attended to.

Fruit-growing is not only an industry in itself, but also from fruits many products can be made such as, fruit powder, pickles, jelly, jam, etc., which industries have not yet been developed on a sufficiently large scale. We have to undertake fruit cultivation on an extensive scale and by scientific methods or we cannot increase their output nor bring down their prices which are often prohibitive. Simultaneously with the introduction of scientific cultivation of fruits, we have to undertake the manufacture of the allied industries like pickles, chutneys, fruit powder, etc., which will provide employment to quite a good number of our unemployed or under-employed young people.

RISING PRICES

The prices of some essential commodities have registered a steep rise in recent weeks. All sorts of excuses are being put forward by the trades concerned to explain this phenomenon which cannot but be regarded as curious when judged in the context of the existing trade depression. So far as the Government is concerned, it has not yet taken any step to curb this sickening trend but has rested content by simply issuing sharp warings to the traders and manufacturers concerned.

First take the case of rice. In most West Bengal districts its price has risen and the Government has enhanced the price of rationed rice in the Calcutta industrial area. The cheaper variety of rationed rice is almost a non-edible, its quality being too poor for human consumption. Authority seldom forgets to hold aloft before people, the prospect of attaining self-sufficiency in rice in the near future and often waxes eloquent on the adequacy of rice stocks built by imports and internal procurement. Why then, we dare not ask, should the price of rice rise? As to the question of improving quality, the Government has evinced a deplorable attitude of callousness. To the public's demand for removing dust and stone chips from rationed rice, the quality of which is not always bad, the Government continues as ever to turn a deaf ear.

The prices of cloth, mill-made dhotis and saris in particular, cost about Rs. 2 to Rs. 3 more per pair than, say, six months ago. This rise in prices is attributed direct to the Government-imposed restriction on the production of the cheaper varieties of cloth. The industry has re-

acted unfavourably to the new dispensation and the West Bengal mills plead they ought to have been granted exemption from the operation of such restrictive measures as they are especially equipped for the manufacture of coarse and medium cloths only. It thus appears that restriction on the production of medium and coarse cloth has benefited none—neither the trade nor the industry, not to speak of the consumers on to whose shoulders all the burden has been shifted ultimately in the shape of an abnormal rise in the prices of the cloths which most of them have to use for no other reason than their limited purchasing power.

Next comes the question of sugar, the prices of which have risen all over the land. Authority attributes them to the industry's speculative activities and not to any reduction in output. Both trade and industry have been asked to desist from hoarding and other similar anti-social activities. But it is doubtful if warnings alone can be enough to pull them back to the straight path. We, consumers, would like to point out that words, mere words, butter nobody's parsnips. Swift and timely action is called for and Authority, we trust, will not fail to profit by its past experiences of the sugar muddle.

Yet another instance of a boom in the midst of a slump is provided by mustard oil, the price of which in the Calcutta wholesale markets has gone up from Rs. 40 to Rs. 75 per maund. This cent per cent rise is stated to be due to higher production costs because of the fancy prices the local mills have to pay for the mustard seed they buy from U.P. It is time the Central Government poked its nose into the matter and took steps to set things right.

DEVELOPMENT OF FISHERIES

India is girt around by the sea on three sides and abounds in rivers and lakes and so there is no reason why efforts should not be made in right earnest to develop fisheries on a well-planned and scientific basis. The deep-sea fishing scheme undertaken by the West Bengal Government more than two years ago, however, has not been a success, even though a lot of money has had to be spent over it. Instead of blaming the failure on anybody, we would expect Authority to be more cautious and calculating in their assessment of the effectiveness of their scheme in supplying the consumption requirements of fish. Moreover, in West Bengal there are inland resources of water and the Government will do well to consider the question of developing inland fishery before it chooses to make any new attempt to catch fish in the sea.

Sea-fishing, as far as this country is concerned is still in an experimental stage. It was admitted by the Norwegian Minister for India when, referring to the Norwegian-aided scheme for fishery development in Travancore-Cochin, he said that the scheme could be extended to other areas only if it proved successful. The scheme in its present form covers only two selected villages near Quilon and is expected to benefit 12,000 fishermen. Referring to the great interest his country is taking in the matter of helping India, the Minister said that Norwegian aid for India was coming not only from the Norwegian Government but also from the people. Upto May, 26, about Rs. 12 lakhs were donated by the people of Norway, besides the funds voted by their Parliament, as part of their "Aid-to-India" Campaign.

POWER FOR MICA BELT

It is heartening to note that the Bihar Government proposes to electrify in two

phases, the mica belt of the State. It produces about 80 % of the world's mica and is spread over an area of 1.000 square miles, mostly in Hazaribagh District. If and when the industry is electrified, not only shall the people of the region benefit but the industry's cost of production too will be reduced. The following extract gives more details of the scheme for electrifying the mica belt of Bihar:—

"Under the first phase, power supply was arranged by the State Government to the mica town of Jhumri Tilaiya in 1950 and to two mines at Sugti and Charki in 1951 from the diesel power station of the Damodar Valley Corporation at Tilaiya. The programme of supplying power to the Kodarma reserve forest are, Domchanch, Masnodih and Shibsagar has also been taken up under the first phase and work in hand is claimed to be making good progress.

"The second phase will be taken up only after the completion of the first. In the Kodarma reserve forest mining area lines have already been taken right up to the mines which had applied for power but which have not yet been able to make full use of it as their installations are not ready.

"The State Government has suggested that the mine-owners should procure electrical equipment well in advance of the commencement of supply.

"The Government has also a programme of erecting lines for power supply from the DVC at Gaya as part of the scheme to feed the Nawada and Bihar Sharif areas in connexion with the grow-more-food scheme for which the Central Government has provided necessary funds. As the scheme of irrigation from surface wells by small electrically-worked pumps have been successful, efforts are being made to extend this scheme to irrigate the vegetable belts of Gaya and its neighbouring areas. Power from the DVC is also being taken to Jasidih and Deoghar where there is a prospect of getting over 1,000 KW of load.

"SHELTERED" INDUSTRIES

A Special Branch has been set up in the Central Ministry of Commerce to ensure speedier investigation into complaints against industries which enjoy a sheltered market in India either because of tariff portection given to them or because of import restrictions in force. A Press Note issued by the Government of India in this connexion state allegations are made from time to time that the grant of protecton to an industry is often followed by a rise in the prices of the products of the industry, deterioration in quality and or shortage of supplies. The Note goes on to say.

"The Tariff Commission itself, which examinining cases for protection, is required under the Act to keep a watch on the progress of protected industries. The scope of the Tariff Commission's work in this sphere, however, is confined only to industries whose case for protection has been recommended by them, and does not cover the many other industries which, on account of the exigencies of exchange, do not face any serious competition in the home market. Even in the case of industries which have been given protection after an inquiry by the Tariff Commission, the Government feel that it is desirable to have a suitable machinery for taking quick and effective action whenever there is a genuine and justifiable complaint."

SPECTRE OF FAMINE

The spectre of famine is haunting some of the districts of West Bengal

including the Sunderbans, Bankura, Hooghly, Midnapore, Burdwan and Nadia. Officialdom is explaining away sickening phenomenon in its old and favourite way, attributing it not to scarcity but to people's lack of purchasing power. Even so, it is difficult to believe that there is no scarcity in the affected districts. If the consumers fail to buy rice because they do not have the money to buy it, the rice of a particular district certainly is not allowed by its owners to rot in go-downs and granaries. They have to send it to other areas, where it may sell. Thus in the affected districts conditions of scarcity are created and so lack of purchasing power and scarcity thrive together subjecting the people to the evil of famine and hunger. Whatever the critics of the Government might say, the Government have not failed to act and the measures, it has taken to alleviate the distress of the people of the famine-affected areas, have not proved altogether fruitless. Already, as recent reports show, the price of rice in the distressed areas is steadily going down. This does not, of course, mean that the condition of the stricken people has improved.

Some of the leftist parties recently met in a conference in Calcutta to discuss the West Bengal food situation. The Conference asked the people to build a united movement to force the Govrnment to yield to their demand for food. But the point is, the word "Movement" is not liked by Authority and those that set it on foot often go the wrong way benefiting neither themselves nor those they fight for. Organised as it was by the leftists who have adopted the policy of opposing the Government, the convention accused the latter of complacency and of having chosen the policy of serving the interests of reactionary elements. But even without taking sides, we would point out that hot words might foment feelings against those in power but not help alleviate the miseries of those who have fallen victims to the widespread famine threat stalking parts of our hapless State.

The convention has demanded that the affected districts be declared famine areas. Authority, however, is an adept in the art of resorting to legal quibbles to avoid doing it. The convention alleged that a good lot of hoarding had taken place of late and wanted the Government to launch a strong drive against the hoarders of foodgrains. This is a very reasonable demand which, if conceded effectively, will succeed in unearthing substantial quantities of rice thereby preventing the further recurrence of the pitiable phenomenon of looking out to the Centre for help. In fact, we regard the demand as so very reasonable that not the Government, but only those who thrive in anti-social activities, should fail to concede it. A novel demand, put forward by the convention, is the one relating to the grant of unemplyment allowances to the workers. The unemployed, whose number is assuming alarming proportions, have the right to demand as much help and relief of the Government as the hapless refugees, from Pakistan and from here to there. The convention also demanded abolition of the zamindari system, introduction of scientific methods of cultivation and employment of surplus population in industrial enterprises. Needless to point out that all these demands are very just and justifiable and the West Bengal Government also is wedded to the ideals they incorporate. Yet they needed reiteration as a spur to speedy action by the Government in the matters concerned. All agree that food should be kept above politics, but politics may sometimes help rather than hinder, provided criticisms levelled

against the Government wake it up to the gravity of the matter.

Mr. Tridib Chowdhury, M.P., made an interesting point in the course of his speech at the Convention. He said the West Bengal Government should send the stock of rice it had procured to different districts and take steps to see that the Centre fulfilled its promise of supplying the requirements of Greater Calcutta. About the reasonableness of this demand any comment seems superfluous, but we are not sure about a crisis overtaking the State in case the Government fails to revise its food policy. In the past, the Government did have to change its food policy under pressure of circumstances and there is no reason to suspect that the Government will fail to do it, if and when the situation demands it. It may be debatable if there has been any large-scale hoarding, but the fact is that large scale purchases have been made by merchants in surplus areas for sale in deficit areas. The Government can take steps to stop profiteering and it can do it effectively by re-imposing the cordon system.

FIRST CLASS TRAVEL

The Railway Ministry's announcement that first class travel on Indian railways will be abolished by October 1, will be received with regrets by none. Very few passengers can afford to enjoy this costly luxury and those who can, will have to utilize the recently introduced air-conditioned coaches for going places by train. At present there is a shortage of air-conditioned coaches. But in the near future this shortage is very likely to be liquidated It is good that the Railway Ministry have decided not to postpone the implementation of their proposal to abolish first class travel, which was first made about a year ago, on the score that at present there is a shortage of air-conditioned coaches.

First Class railway travel is costly, but the earnings from it do not exceed 3 p.c. of the total railway revenues. It is presumed that not all this revenue will be lost. Some first class passengers may take to air travel, but the majority will continue to travel either by the air-conditioned services or by second class. Not only are the earnings from first class travel low, but their maintenance costs too are very high. This perhaps, is the main financial consideration which has led to the decision to abolish it altogether. Moreover, it is said, that while there is a great rush of passengers in other classes, most first class coaches go empty and are not fully utilized. Air-conditioned service on the other hand, is proving popular. The Ministry, therefore, intend to increase the number of air-conditioned coaches which is only about 40 at the present moment.

JUTE INDUSTRY

Addressing the Export Advisory Council some time ago, Commerce Minister, Mr. T. T. Krishnamachari expressed confidence in the future of the jute industry. He said that in the coming year the demand for jute and jute goods would rise in every country as soon as efforts were made to improve economic conditions. The Indian Jute Mills Association is now busy contacting the foreign buyers of our jute and exploring how best it could expand markets for it in the outside world. Mr. Krishnamachari praised these efforts.

Up till recently, the Indian jute industry has been facing a very critical situation. The foreign markets for Indian jute goods had been declining, prices had

been going down, and there was a very big accumulation of unsold stocks. Exports fell to 705,000 tons in 1952-53, the lowest on record since 1947 and 100,00 tons less than during the previous year. But on the bright side of the picture, we have to reckon with the fact that in 1952-53 our exports to dollar areas rose to 304,000 tons from 154,000 tons in 1951-52. Cost of production which had been high because of the high prices of raw jute is now a little lower and the prices of our jute goods have come down. This reduction has been effected also by the Government's measures to lighten the burden of export duty on Indian jute goods.

Already, there are signs which make a happy augury for the future progress of our jute industry. Owing to reduced prices our jute goods to-day are in a better position to compete with Continental jute manufactures and their artificial substitutes. The countries interested in Indian jute goods include Argentina which wants our hessian; the Middle East which is interested in our sackings; and Australia and New Zealand. According to the Indian Jute Mission which recently returned to India after a four-week tour of Australia and New Zealand, there is a "secure and expanding market" for Indian jute goods there.

We can place our jute industry on an even keel if we could take steps to stabilise the prices of our jute manufactures. That is the way to combat competition either from Continental jute goods or from substitutes like paper and cotton made bags. The latter are no match for jute goods and one has to buy them for no other consideration than that of cheapness. So all interested in the prosperity of our jute industry should make it a point to bring the price of our jute goods down to a stable level and ensure their regular supply at stable prices. The oversea buyers of our jute goods cannot but be reluctant to buy them if their prices undergo fluctuations as often as a weather-vane changes its direction. Hence some are advocating rationalisation of this country's jute industry.

TEXTILE OUTPUT

Many will be glad to learn that GOI have extended the term of the ILO Productivity Mission which has been in this country since December last. The Mission's term has been extended up to the end of November next and this is by way of recognition of the useful services it is rendering to the textile industry with a view to raising its output. The engineering industries too are receiving the expert guidance of the Mission. The extension, given by the Government, is necessary because the Government wants to consolidate the results obtained by the team and set up a similar machinery to continue the good work now being done by it. The ILO team is showing in some selected factories of Bombay and Ahmedabad how the output of cotton textiles can be raised by the application of modern work-study techniques, and without retrenchment of labour and any addition of capital equipment. The team thinks that even under the existing conditions the industry can be expected to raise productivity by 20 to 25 per cent by adopting the methods it is demonstrating.

Growing Fruits in India

FRUIT GARDENING

Fruit gardening is one of the profitable avenues which will absorb a large number of educated youngmen. This appeals to intelligent youngmen because the work is pleasant, because of the leisure at certain period of the year, and because it is more profitable than general agriculture. Another aspect which strikes the wanderer interested in fruit expansion and specially in that of the mango is the apparent dominance of old orchard and comparative scarcity of new or recent plantings. However, a number of more progressive farmers are now developing orchards on more modern lines, and the interest which is being shown promises a brighter future for this branch of agriculture. There is need for youngmen with a sound knowledge of horticulture to provide technical leadership for the industry.

Soil and climatic conditions in India are very favourable to a large number of fruits. There is a considerable variety of soil, types, but deep loam soils, suitable to most fruits, are very common. The mango and most of the subtropical fruits grow well on the plains, while in Kashmir, the Kulu valley, the Kumaun hills and elsewhere in the Himalayas apples, pears and other temperate fruits can be grown successfully. In the submontane tracts, especially in the districts of Dehra Dun, Saharanpur, Muzaffarnagar and Meerut, peachts, plums, berries and other fruits of the milder temperate zone do very well. The Himalavan districts are faced with a very difficult problem in transporting their fruits to the centres of population, but the fruit growing districts of the plains have a good present market, and an enormous potential market.

While conditions are thus favourable, it must be recognized that irrigation is essential, and that profitable fruit growing depends on an economic source of irrigation water. This is undoubtedly a limiting factor at present. There are, however, large tracts under canal irrigation, and other areas in which the water level is near enough the surface to make pumping entirely feasible. With the increasing development of water power and cheap electricity the use of tube-wells makes irrigation economical over large areas. With the increase in irrigation should come an increase in fruit growing.

The present demand for fruit fully justifies such an increase. This market is almost entirely in the cities, but the fruit supply in these centres of population is far from adequate. Without considering the possibilities of extra-provincial markets as the development of fruit sales in the Punjab, we have within our own boundaries, markets which with better and more economical methods of growing and care, better transport and better placing of our fruit—would be able to absorb two or three times the fruit they now do. The present price of fruit is so high, except during market gluts, as to put fresh fruit out of reach of a large part of the population. With more efficient production and marketing, the price could be so reduced as to encourage a tremendous increase in consumption and still provide a good profit for the grower. It is significant that citrus fruits, apples and other fruits from Palestine, Japan and the United States now compete with Indian fruits even in inland cities.

The present demand for fruit justifies increased production, but the potential

market is much greater. The dietetic value of fruit has been definitely proved only in the present century, and the public is only beginning to realize the necessity of including fresh fruits and vegetables in the regular diet. The demand for fruit is thus increasing among the educated classes and will continue to increase as knowledge of its value spreads. Even in a city like Bombay, the sale of fruits and vegetables amounts to only half an ounce per head, as compared with 4½ ounces in London and One pound in New York. Gadgil and Gadgil estimated the consumption of fruit in Poona at one ounce per person per day.

Not only may the city market be greatly expanded, but the rural market, potentially much larger, remains almost untouched. Seedling mangoes are eaten by practically the entire population during the season, but many villagers eat no other fruit. This is largely because fruit is not available in the villages, or if available, is beyond the means of the people. The village market cannot be developed until the price of fruit is lowered or the purchasing power of the people is increased. As stated above, it will be possible to lower the price when the yield per acre is increased. A general rise in the standard of living is essential to the welfare of India, and is an object of all rural reconstruction programmes. There is therefore reason to expect that as fruit growing develops the rural market will absorb an increasing proportion, at profitable rates.

The development of fruit growing which seems possible and which is now beginning, will be of great benefit to the country. The consumption of more fruit will doubtless have a beneficial effect on the health of the people. The use of land for fruit instead of less valua[ble] crops is an economic advantage to [the] country.

The health giving character of so[me] fruits has been rather widely recogniz[ed] but many people still regard fruit as [a] luxury rather than a food which sho[uld] form part of the daily diet. It is true t[hat] if the value of food be measured in ca[lo]ries alone, there are other forms wh[ich] are much cheaper than fruits. Howev[er] some fruits are important foods, ev[en] from this limited point of view. M[any] contain considerable amounts of su[gar] and starch, and the avocado and ol[ive] are important sources of fat, as are t[he] nuts. Protein is found in very sm[all] amounts. But it is now recognized t[hat] a diet of protein, fat and carbohydr[ates] is incomplete, and that for the mai[n]tenance of health certain minerals a[nd] vitamins are required. Fruits are a ve[ry] important source of mineral salts. The[y] are especially necessary for the produ[c]tion of bones and teeth, and sho[uld] therefore be supplied to childern [in] adequate quantities. Vitamins are fo[od] factors discovered comparatively recent[ly] and still imperfectly understood. The[re] are a number of these, and the comple[te] absence of any one from the diet resu[lts] in sickness or imperfect developme[nt]. There are certain "deficiency" diseas[es] which occur when the diet contai[ns] insufficient amounts. Most fruits a[re] valuable sources of several vitamins. [So] are also tomatoes and green vegetabl[es]. The orange and other fruits have lo[ng] been recognized as one of the be[st] sources of vitamins. In fact, the te[rm] "lime juicer" for a sailor in the Briti[sh] navy, was applied because lime juice w[as] provided them, to prevent scurvy, befo[re] it was known that scurvy was caused [by]

a lack of vitamin C, or ascorbic acid, and that this was supplied by the lime juice.

Investigations have shown that the guava and aonla are much richer sources of vitamin C than the citrus fruits. The mango, pineapple, papaya, and strawberry, and according to Damodaran and Srinivasan the cashew apple, castard apple and jujube are also good sources of this vitamin, while many other fruits contain some. Carotene and other pigments from which the body manufacturers vitamin A, are found in great abundance in the mango, to a considerable extent in papayas and persimmons, and in smaller amounts in oranges, particularly the loose-skinned type, and in a number of other fruits. Vitamin P or citrin, one of the less known vitamin a lack of which is said to result in bleeding under the skin, occurs in the citrus fruits, in paprika, and largely in black currants. Rege and Devadatta report thiamin (BI) in the banana, orange, and sapodilla.

SOILS, MANURES AND FERTILISERS

Before we talk of growing plants, it is necessary that we must know something about the soil—the medium which supplies the necessary nutriment to the plants. One should try to understand and make use of the knowledge so gained about the soil before taking to gardening. However excellent the instructions and suggestions contained in manuals on gardening, they are all worthless if they are followed blindly without picturing visually the composition of soil which is to be worked upon. Every operation undertaken must be preceded by theoretical reasoning.

SOIL.

Soil is loosely speaking, a mixture of solids, liquids and gases in varying proportions.

Ingredient:	Size of Particle.
Clay	Less than 0.002 mm. in dia.
Fine silt	0.01 to 0.002 " "
Coarse silt	0.01 to 0.01 " "
Fine sand	0.2 to 0.01 " "
Coarse sand	1.0 to 0.2 " "
Fine gravel	3.0 to 1.0 " "

Lime and plant and animal remains also form the solid portion of the soil.

Assuming that in the formation of soil, mineral particles form the base of formation to which other constituents are added or attracted, we may look upon the fine textured clay and the coarse textured sand as being the two parents, each being typical of a group of soils.

The properties of these two groups may be briefly compared as under:—

Clay.	Sand.
Fined grained	Coarse grained
Heavy (to work)	Ligh. (to work)
Wet	Dry
Cold	Warm
Late crops	Early crops
Rich (in plant food)	Poor (in plant food)
Unwilling (miser)	Willing (spendthrift)

SIX TYPES OF SOIL AND THEIR CHARACTERISTICS

It is usual with the cultivators to recognize six types of soils: (1) Clayey, (2) Loamy, (3) Sandy, (4) Calcareous, (5) Peaty, (6) Alluvial. It will be useful to know at length the properties of each type of soil.

CLAY

Clay (Finest grained portion of the soil) when worked carries its normal water charge and becomes thereby altered in texture and takes on a certain putty-like plasticity. This fact is made use of when we make certain reservoirs and ponds water tight. They are lined with what is known as puddled clay. On the other hand it is an old time warning that it is a mistake to work upon the heavy soils

while they are wet. The puddling that results from the neglect of this advice is apt to produce large and heavy lumps of soil that hardens in subsequent wind and sun and greatly impedes cultivation for the remainder of the season. Clay from which the water has been expelled by evaporation at temperature about 212°F. loses its stickiness temporarily. The stickiness returns with the return of moisture. This explains how, whilst heavy soils may, if carefully managed, be brought into a fair condition of tilth during the summer months, the improvement is only transient and the intractibility returns with the first rains. Clay when burnt at a high temperature as in the making of bricks, loses its plasticity and stickness and never returns to its original state. A permanent improvement in texture takes place.

Clay shrinks on drynig as has been already explained and this shrinkage in dry summer is so considerable that large cracks in the ground make their appearance. These cracks fill up, however, after the coming of heavy rains. This quality of alternate shrinkage and expansion under varving conditions of moisture explains to some extent the otherwise puzzling fact that whilst the crops under heavy soils are slower in feeling draught effects than those on the light soils, they suffer more if the draught be prolonged than do crops on sandy media. The extensive cracking referred to leads to the breakage and death of many roots.

Clayey soils require to be lightened down to permit more speedy movement of contained water and permit free ingress of air for the better growth of the plant.

The lightening material may consist of :—

(a) The drier, forms of farmyard manure, such as manures from the stables in which straw has been used as a bedding Liberal dressing of fallen leaves is also useful.

(b) Gritty material of some kind sand, burnt earth, wood ashes, or even screened coal ashes free from uncombusted material.

(c) Green manure crops as indigo stalks, hemps, leguminous crops, jute, etc. be ploughed whole into the soil.

(d) Lime in the form of quicklime or hydrate, rearranges the particles, flocculates and tends to make the whole mass amenable to cultural operations.

LOAMY SOIL

Loamy soils are very useful soils for the plant growth. Properties are intermediate between clayey and sandy soils. They are most useful for gardening as the plants form good roots and the soil imparts to the plants nutriment readily.

SANDY SOIL

Sandy soils are the hungriest, warmest, driest and the most porous soils due to the relatively large particles comprising such soils. Sand when pure contains absolutely no plant food but its mixture with other soils, imparts friability, porosity and encourages full and continuous aeration. Sea sand however contains lot of common salt and say up to 1% calcium carbonate and possesses decidedly manurial value. Sandy soils have a great reputation for early crops for the market and the garden purposes. For pot culture, clean washed river sand is suitable.

CALCAREOUS SOIL

They are generally thin and often hungry soils, overlying chalk or lime stone. They produce excellent crops provided generous additions of the well rotted manure (Humus) are made. These crops

may suffer from lack of water and may be subject to that yellowing of foliage technically known as Chlorosis. Marly soils though they differ considerably in their physical characteristics may, however, be admitted to this group. They are really clays or heavy loams which have a high content of calcium or magnesium carbonate. They behave as tractable clay.

PEATY SOILS

Peaty soils are deficient in lime but differ markedly in their behaviour. They have high content of carbon. Wet, black bog peat is the worst.

ALLUVIAL SOILS

The richness of alluvial is proverbial. After the floods have subsided, the matter previously held in suspension by them is left behind as a fertile deposit. Land so treated is known as the warp land and like the deltas of the river is rich in alluvial soils. These soils are generally characterised by the presence of considerable quantity of salt.

LIME

The presence of sufficient lime and humus (decayed or decaying matter in all its stages of decomposition) is quite necessary for a good soil.

Lime is an essential element required for plant nutrition. It assists in setting free other plant foods as potash; flocculates the clay and by producing a coarser texture makes the clay more tractable; counteracts acidity commonly known as sourness. Being a base, lime combines with acids and thus builds up salts from which the plants ultimately draw their food. It is necessary for the decomposition of organic material plant and animal remains, and assists nitrification and is a useful agent in the reduction of attacks of club root and is also distasteful to certain insects.

Lime may be present in the fertile soils in the hot or caustic form such as quicklime and hydroxide of lime and in the cold form it may occur as carbonate of lime, e. g., chalk, crushed shells.

A very simple and handy test for finding out whether a particular soil is deficient in lime (sour) or not, consists in saking 0. 3 or 0. 4 oz. of soil with a saturated solution in alcohol of potassium thiocyanate. If it is coloured crimson or scarlet, it is deficient in lime. The depth of the colour marks the degree of acidity. Another handy method consists in making a thin paste with water of a small quantity (say ½ pint) of soil to which is added ½ oz. of strong hydrochloric acid (Muriatic acid). Frizzing out of carbon dioxide gas may be heard by a man of normal hearing when placed 9" from the ears. This shows that soil is good, otherwise it requires liming.

If a soil is deficient in lime it is soon overgrown with certain weeds like sheep's sorrel (R. Acctosella), sour dock (Rumex acctoca), spury (Spergularvensis), etc. All these weeds serve as indication of the soil acidity.

There are fruit trees such as cherries, plums which are notable lime-lovers. If these fruits makes healthy stones, the soil in which they grow contains sufficient lime. Among vegetables, peas, beans, turnips, cabbages, etc. are pronounced lime-lovers. Successful crops of these mean that the soil is rich in lime. For heavy soils the caustic form of lime, calcium oxide (quicklime) or calcium hydroxide (hydrate quicklime) at the rate of 2 tons per acre in alternate years is sufficient: for light soils, colder forms of lime such as ground chalk produce excellent results. 2 tons of ground chalk per acre in two or three years is usually specified. Crushed and ground gypsum

at the same rate may be employed with profit.

HUMUS

Humus imparts dark brown colour and improves the efficiency of the soil as heat trap; this quickens the growth of the plants. It causes the soil to puff up and ferment so to say and thereby increases the pore space necessary for the better drainage of moisture, circulation of air for the growing plants. It increases the water holding capacity of the soil and tends to make light and hungry soils more holding and less hungry.

In the earlier stages it is very hygroscopic. It shrinks in bulk when dry and expands when wetted. Humus at various stages is coagulated by acids, salts, electric current and frost. It forms colloidal (gum like) mixtures with other colloids, masks when present in quantity, certain [illegible] reaction and also forms certain absorption compounds.

For pot composts (for special plants) the best leafmould prepared from the leaves of hazel, beach, oak, and sweet-chestnut is used.

AMELIORATION OF SOIL

For active growth of plants the physical condition of soil is as well important as its chemical composition. A soil may be improved and enriched in four general ways:—

(1) By good preparation

(2) By tillage

(3) By application of various substances [illegible] and humus, fertilizers (concentrated plant food) gypsum.

(4) By a proper system of cropping—rotation of crops as it is called.

BY DRAINAGE ARRANGEMENTS

An efficient drainage is very necessary. Drainage serves two purposes.—It carries superfluous water from the land [illegible] lowers the water level and thereby ma[kes] the soil loose and friable above. Nea[rly] all hard clayey lands are much benef[ited] by drainage, even though they are [not] wet. The region of free or standing wa[ter] is lowered and air is admitted into [the] soil, renderning it fine and mell[ow]. Surface water may be carried away [by] surface or open ditches but if the soil [is] to be ameliorated, the drain must [be] underneath the surface. The best und[er] drains are those of hollow or cylindri[cal] tiles.

BY TILLAGE

Tillage is the stirring of the soil [for] the purpose of improving its producti[ve]ness—a fundamental operation in agric[ul]tural practice. Tillage makes the soil mell[ow] and fine and agreeable place in wh[ich] plants may grow. Light soils are handl[ed] differently from heavy soils and much a[lso] depends upon the season of the year. [In] all ordinary lands, effort should be ma[de] to work them deep, so that there [is] sufficient reservoir for the storage [of] moisture and a large area in which t[he] roots can work. Subsequent tillage duri[ng] the season is performed largely for t[he] purpose of keeping the top soil loose a[nd] fine so that the moisture from benea[th] can not pass off into the atmosphe[re]. This loose layer of soil 2"—3" from [the] surface may itself be dry but it breaks the capillary connection between the low[er] soil and the air. The evaporation is ther[e]by checked. The above surface is call[ed] in this case earth mulch and answers t[he] same purpose as a mulch of straw or leav[es] in interposing a material between the mo[ist] soil and air. Surface should be tilled [in] growing season as often as it tends [to] become compact or encrusted. This [is] after every rain and usually as often [as] once in ten days when there is no ra[in]

d clay soils should not be worked le wet or clay balls cement together become very hard to break. Lime erises: straw, stubble or dressing of nure prevent clay from puddling.

BY MANURE

Manure adds plant food and also roves the texture or physical condition the soil. Manure when thoroughly rporated with the soil, makes the and congenial for the plant. The nure for the garden operations should otted or composted well. A well rotted nure quickly gives up its fertility. The ore method of coposting is considered t up-to-date. The most desirable nure for the garden and for house- its is probably old cow manure for it s not burn or lose its strength. and led under shelter for a number of rs becomes more available each year. mixes well with soil and leaf-mould. ien once rotten, this manure is very ing and is easily assimilated by plants. se manure is too loose and dry, and n becomes overheated and so is not ful for many purposes. Sheep manure n used in liquid form is the best. Pig nure may be well composted with loose h or refuse before application.

All garden leaves, sweepings may be l rotted before application. It is best apply the manure in autumn so that it omes incorporated with the soil before ng.

FERTILIZERS

Commericial fertilizers add plant food generally do not improve the faulty ure so land should be put in a good sical condition by judicious tillage or ition of humus to get best results. deners should always have on hand centrated fertilizing materials reprtsent- Nitrogen, Potash, Phosphorie acid and Lime. These are good supplement to manure or compost, and they may be applied effectively also in the row or the hill when seeds are sown or when plants are transferred from flats or pots.

Two useful general mixtures however, have been recommended for all types of crops, fruits and vegetables.

FOR HEAVY SOILS

1 part of Sulphate of Ammonia.
1 part of Sulphate of Potash.
3 parts of Superphosphate.
Use 3 oz. of this per sq. yard.

FOR LIGHT SOILS

1 part of Sulphate of Ammonia.
3 parts of Kainit.
3 parts of Superphosphate
Use 3 oz. of this per sq. yard.

EARTH MULCH

We have already talked of the earth mulch for retaining the moisture through dry season and preventing evaporation. Mulch is employed both in protecting the plants from severe freezing and severe draught. The mulching of the ground around black-berries, currants, gooseberries or raspberries, with straw or hay is often practised to keep the fruit clean.

3 to 4 inches of mulch is sufficient. Winter mulch usually consists of leaves, straw, hay, boughs of ever-greens, rough manure, in short any coarse material that will protect the plant from severe weather and the heaving caused by alternate freezing and thawing. Too strong and heavy manures should not be used as winter mulch, for then the plants may be injured by leaching.

HINTS ON FRUIT GARDENING

Before we discuss at length the various factors to be kept in view for successful gardening, it shall be of interest to

the reader to go through the general instruction in the form of twelve commandments issued by the Punjab Agricultural Department. They are based upon wide knowledge and practical experience.

TWELVE COMMANDMENTS OF FRUIT GARDENING

"Soil:—Thou shalt not select for a fruit garden a kalar (salts eaten) soil or one with layers of gravel. Select soil that is loamy, rich, deep and well-drained.

Lay-out:—Thou shalt not lay out thy gardens haphazardly. Use a well thought out plan with trees at right distance and thus enhance the beauty and life of thy orchards and avoid future worries.

Plants:—Thou shalt not obtain thy plants from an unreliable source. Plant only healthy trees, those free from disease. A cheap tree proveth costly in the long run.

Pruning:—Thou shalt not leave thy trees to grow as in nature. Prune to shape thy trees, to maintain vigour and productivity. A vast shaped tree with properly spaced branches is the best.

Irrigation:—Thou shalt not allow irrigation water to touch the trunk of thy trees; but heap soil round it. Widen basins as far as the branches of any trees spread.

Cultivation:—Thou shalt not allow weeds to grow in thy garden. Cultivation keepeth down weeds, conserveth moisture, and increaseth fertility.

Manuring:—Thou shalt not starve thy trees. Heavy manuring secureth regular and heavy crops. Manure thy trees with well-decayed farm-yard manure and apply green manuring wherever practicable.

Spraying:—Thou shalt not let fungal and insect pests flourish unchecked in thy garden. Timely spraying saveth an orchard from ruin.

Wind Breaks:—Thou shalt not let storms damage thy trees and fruits thereof. Plant wind-breaks around thy orchard to save thy trees from the effect of winds and storms.

Intercropping:—Thou shalt not leave the land idle when thy trees are young. Vegetables and leguminous crops like senji, berseem, gram, guara, etc. keep down weeds and give good returns.

Harvesting:—Thou shalt not handle thy fruits roughly. Pick fruits gently, for rough handling injureth the skin of the fruit and causeth decay. Grade thy fruit according to size and quality and pack in cases of standard size.

Marketing:—Thou shalt not strive to sell thy fruit by thyself. Co-operative marketing giveth increased returns. Join some well organized marketing society of your province. Refer your difficulties to the agricultural department of your province."

CHOICE OF SOIL FOR THE GARDEN

Only deep and good-bodied soils are suitable for fruit crops. Texture of the soil is not so important as at one time it was thought to be, because it can be changed to advantage by addition of lime, judicious manures and fertilizers and proper tilth. Although a poor soil cannot compare with a rich soil in productivity yet if the climate is good and market facilities exist, the former need not be despised as it can be enriched to give profitable returns.

It is essential that in selecting a good site for the garden, inference as regards the suitability of the soil should not be made from its surface conditions. On the other hand a deep boring in the soil is made to inspect the various strata lying

below upto 8 feet at least. If it is found that there is a layer of kankar, gravel, coarse sand, hard pan layer or very heavy soil layer in the underneath soil, the site should not be considered fit for gardening. If the presence of any of the above defects in soil occurs below 4 feet from the surface, the soil is called shallow bodied. Such soil is only fit for trees as grapes or pears whose roots do not go deeper than 4 feet, provided the soil is artificially enriched and proper watering and drainage is ensured.

If the water table is very high (say 6 feet) the site is unfit for gardening, because such sites become water logged and roots of trees due to lack of proper aeration die out. A fluctuating water table is more dangerous than a high stationary one, for when the water table goes down, the roots of the trees, in their search for water also go down and when it rises in any period of the year, the roots get submerged and die out for want of air. Soils subject to periodic flooding should be rejected if there is no proper system of drainage. If Kalar (accumulation of salts on the surface in dry areas) is present in large quantity, the soil is unfit for gardening.

Black Kalar is more dangerous than white one. The fruit trees can tolerate up to 0.02% of kalar provided the black one is present in smaller amounts. The soil which proves unfit for ordinary crops, is also unfit for the garden crops.

SELECTION OF SITES FOR GARDENING

Sites in low-lying valleys where water abounds should always be looked with suspicion By reason of the havoc which late spring frosts often work at blossoming time.

Site near a lake or a large body of water is to be preferred due to the moderating effect on the climate which water exerts. The strong winds passing over such a large body of water lose their force and do not harm the garden trees. Rather, the view towards the water should remain open and need not be hedged in.

PROPAGATION OF PLANT

Propagation of plants is the chief aim of the nurseries. The plants may be raised by various methods: (1) Seeds, (2) Division, (3) Layering, (4) Cutting.

FROM SEEDS

The trees raised from seeds posses the following points of merit:—

(1) They are said to acquire comparatively a bigger and greater size.

(2) They attain to a long life and after the trees have once begun to fruit, require subsequently little care.

(3) They resist the attacks of the diseases and the winds admirably well.

(4) Sometimes new superior varieties result from the seeds. But they suffer from the main defect that unlike the grafted varieties they are not true to the parent stock. The trees for grafting or budding are first raised by this method.

Mangoes, mithas, peaches, tut, loquats, guavas, blackberries, phalsa, jujube plants can be raised from stones.

Before the seeds are sown it is necessary that a seed bed may be prepared. The soil should be loose and porous to allow the excessive moisture to escape and the warmth to penetrate. The nursery bed may be square or rectangular in shape divided into smaller squares 10″ × 10,″ each served with a water course on one side. The ground should be dug at least to 12″ so that plants may stick easily and roots may spread quickly.

In every square, one-fourth of a gunny bag of well rotted cow manure may be

mixed in the soil. Then a slight dressing of lime may be given. Lime makes the clayey layer porous and if the soil happens to be sandy it makes it sticky so as to conserve the moisture. A thin layer of sand may be spread at the top to prevent the young saplings being attacked by the fungus Damp off.

The seeds are sometimes also raised in earthen pots called gamlas. A hole is made at the bottom and on it are placed some gritty stones to effect proper drainage. These are next filled to about 1" from the top surface with a mixture of well composted leaf manure and loamy soil in equal parts.

It is better to sow fresh seeds for if kept in air for long they will take long time to germinate.

In the southern Punjab the following observations have been made for fresh seeds to germinate:—

Name of Fruit free.		Proper season of sowing seeds.	Time for the germination of the seeds.
Mangoes	.....	June to August	22 days.
Jaman	.....	July	30 "
Phalsa	...	May-June	10 "
Guavas	.....	August-September	22 "
Jujubo	.....	March	30 "
Loquats	..	April-May	60 "
Lemons	.....	September	20 "
Mithas	...	October-November	20 "
Guavas	.....	September-October	5 "

The depth to which the seeds are to be embedded depends upon their diameter. Seeds of guavas, tut, phalsa, khatta, mithas, and lemons are only pressed with the hand at the surface so that a thin layer of earth covers them. Mango may be buried in the earth upto the depth of its diameter. Seeds of fruits like mangoes and jaman should be set one foot apart while those of loquats and phalsa only six inches apart.

Just after sowing the seeds watering may be given. No hole should be left in the soil or the seed will remain exposed and will not germinate. Only when the upper surface becomes dry watering should be made. Weeds and rank vegetation should be cleared and ground forked. In rainy season care must be taken that water does not remain collected in the seed bed or the organic matter will begin to rot and the plants will be destroyed. A sprinkling of powdered charcoal, well rotted manure and sand proves serviceable in that damp case. Plants usually take quickly if transplanted on a freshly spaded or ploughed land on a cloudy day if possible.

BY LAYERING (DABA)

Layers are parts (usually stems), laid on the earth while still connected to the parent with the hope that they will take root and can then be separated as independent plants. The vine-like plants can be propagated readily by means of layering. So can most soft wooded plants as willows, maples, and currants. Lime seedlings are also raised in this way. It is usual to put down the branches in the fall and in a year they are ready to be cut off from the parent. They may also be made in spring before growth starts. Branch near the ground should be chosen. It should be strong and not likely to break on bending. Its diameter should at least be half an inch and it should be at that time making fast growth and free from disease or pests.

The ground where the branch is to be buried should be dug to at least one foot in depth, the grasses and rank vegetation should all be weeded out and well composted farmyard manure should be liberally applied to the soil. A notch or crack should be made below the middle

bud of the branch to be buried at the point by means of a sharp knife drawing across the branch only once. A small stone or any other hard thing may be placed in the split. Sometimes the underneath surface of the branch at the point where it is to be buried may be cut with a sharp knife in a manner that the bark as well as a part of the wood may be peeled off from an area 2″ × ⅓″. The object of such procedure is that the sap of the tree may not collect at the point and the upper or the lower bud near the notch or the peeled off portion may shoot down roots into the soil and should not throw up the suckers behind the layered part. The part to be buried in the earth should be stripped of the leaves and branches and should be pegged down 9″ in depth with a stone of a clod or when irrigation is made the branch will rise up.

The end of branch away from the earth should rise erect and not in a slanting manner. The plants may be watered just after laying. The ground may be forked up to a depth of 3″ after the ground is dry enough after irrigation. Watering should only be made when the upper surface is quite dry.

To judge if the operation of layering has suceeded and a new plant has been formed look to the following points:—

(1) The branch of the parent stock towards the tree, above the ground, dries a little and the branch on the other side of the layering point appears vigorous and fresh in growth.

(2) The leaves on the branch of the other side point towards the sky.

When you find that layering has been successful, cut the branch on the side of the parent stock to one fourth every week. When the branch has been cut, then transplant in the nursery.

A special kind of propagation in which part is not severed until roots form, is known as air-layering or pot layering because the roots are stuck in a pot or ball of moss secured to a branch or trunk that cannot be bent to the ground. A notch is usually made at the desired place and earth held round it by splitting a pot and applying it to the limb. When sufficient roots have been formed in the pot, the branch is severed beneath it, the top shortened in and the part treated as independent plant. The atmosphere should be moist, if possible, when the operation is performed particularly if the part is merely balled with moss and without a pot or other protective.

FROM SUCKERS

Suckers are the roots that rise up the ground near about the stems of the fruit trees and then develop into fruit trees. Dates, bananas, pears, apples are usually raised from their suckers. The suckers should at least have attained a height of 2 feet and should be cut and transplanted when they are in the dormant state. A sharp axe or knife or saw may be used to avoid too many wounds to the roots. The nursery should be situated in a shaded place.

Roots of the pears are usually cut in January when they are 4 feet high and set in the nursery. Similarly the suckers of apples should be cut in December when they are about 2½ feet in height.

Suckers of bananas may be transplanted direct into the garden in March when they are about 6″ high. Date suckers are usually removed from September to February when they are 5 or 6 years old and may be set in the garden.

In the nursery beds for almonds and pears a small quantity of lime may be sprinkled. These should be planted at least one foot apart.

Before setting the plant cut the stem upto a height of 3 feet and fix in the ground in such a manner that the roots of the suckers are not jumbled together in one mass but spread sufficiently apart to form a bigger base of the roots and moreover the stem of the plant should *stand erect. The roots may be pressed down with fine pulverised earth and all the holes should be filled so as to prevent the roots being exposed to air or sunshine.*

The plants may be watered and irrigation should only be made when the top surface is dry.

After the elapse of 2-3 months from the time the suckers were set in the nursery. The beds may be provided with composted and rotted manure one-fourth of a gunny bag, or Ammonium Sulphate or sodium Nitrate at the rate of one maund per bigha.

When the suckers have stood in the nursery for a period of one year they may be transplanted to their proper sites in the garden.

July to September or December to March are the usual seasons of doing such operation.

It should be remembered while setting the suckers in the nursery beds or in the garden that the stems of the suckers may be pitched in the soil upto a level previously occupied in the soil.

FROM CUTTINGS

Cuttings are parts of plants inserted in the soil or water with the intention that they shall grow into new plants. Several classes of cuttings (with respect to the age of the wood or tissue) are known.

HARD WOOD CUTTINGS

These are made from perfectly hard or dormant wood (taken from the winter twigs of the trees and bushes). These are used for grapes, currants, gooseberries and other soft wooded trees. Cuttings are ordinarily taken in fall or winter, but cut to the proper length and then buried in sand or moss where they do not freeze, that the lower end may heal over or calus. In the spring *these cuttings are set into the ground preferably in a rather sandy and well drained place. Usually hard-wooded cuttings are made. With 2-4 joints or buds, only the upper bud projects above the ground when they are planted erect* or somewhat slanting. 8"-12" should be the size of the cutting. To prevent too many shoots emerging from a cutting made of short jointed wood, the lower-most buds be cut down to let the roots start readily. Cuttings of grapes, currants, mithas and khattas, gooseberries and the like may be set far apart (3" to 8") to admit of easy tillage. After the cuttings have grown, they are transplanted and allowed to stand for a year or more before set in a permanent plantation. Two-year plants are stronger and preferable. The cuttings usually take 20-30 days to grind roots When the plants have grown 2 feet high, well rotted manure or ammonium sulphate at the rate of one maund per bigha may be supplied to the nursery beds to hasten the growth of the plant.

ROOT CUTTINGS

Roots cuttings are used for blackberries, raspberries, etc. They are made from the size of a lead pencil to one's little finger and are cut 3"-5" long. They are stored until spring as above and are planted in horizontal position in moist sandy soil being entirely covered to a depth of 1"-2".

SOFT WOOD OR GREEN WOOD CUTTING

They are rooted under cover, in a cold frame, green house or a dwelling

place. Wood should be mature enough to break on bending sharply. One to two joints are the proper length of a green wood cutting. The lower leaf should be cut-off and the upper leaves cut into two if of two joints. The idea is that air may not evaporate the plant juices readily. If the cutting is only of one joint, the lower end is usually cut first above a joint. In either case, the cuttings are usually inserted in sand or well washed gravel, nearly or quite upto the leaves. Bed should be keot fairly moist throughout its depth but it should not get muddy or sour. These cuttings should be shaded until they begin to grind roots. Green house plants are usually started by such cuttings.

BY GRAFTING

This is the operation of inserting a piece of plant into another plant with the intention that it shall grow. It differs from the making of the cuttings in the fact that severed part of the plant grows into another plant rather than in the soil. There are two kinds of grafting:—

(a) Inserting a piece of branch (scion) in the stock (the plant upon which the severed piece is stuck) is called grafting proper; (b) Inserting only a single point with a bit of tissue (bud) in the stock with little or no wood attached is called budding.

In both cases the success of the operation depends on the growing together of the cambium of the scion (or cutting) and that of the stock. The cambium is the new and growing tissue which lies underneath the bark and on the outside of the growing wood. The greater part of grafting and budding is performed when the scion or the bud is nearly or quite dormant. that is usually in winter and early in spring. Budding may be undertaken then, or late into summer when the buds have nearly or fully matured. The chief object of grafting is to perpetuate a kind of plant that does not reproduce itself from seed or of which seed is very difficult to get. Scions or buds are therefore taken from this plant and set into whatever kind of plant is available on which they will grow. For example, Malta scions or buds are grafted on khatas. Malta seedlings as stocks may be raised by seeds or cuttings as the case may be.

GRAFTING PROPER

Grafting proper is the insertion of a small branch, (or scion) usually bearing more than one bud. In grafting on small stocks, the stock and the scion are cut across diagonally, and split made in each so that one fits into other (whip graft). In larger stocks or limbs the cleft graft method is employed. It consists in cutting off the stock, splitting it and insering a wedge-shaped scion in one or both sides of the split taking care that the cambium layer of the scion matches that .of the stock The exposed surfaces are then securely covered with wax. (A good wax is made by melting together on a water bath 4 parts of resin, 2 parts of beeswax and 1 part by weight of tallow). Grafting is usually performed early in the spring. just before the buds swell. If the tree is very young, budding or whip-grafting may be employed. The top of the aged tree (say, old plum, apple or wild berry) may be changed to some other better variety by means of cleft graft.

BUDDING

Budding is performed when the the bark is still loose or will peel (July to early Sept.). Twigs are cut from the tree which it is desired to propagate, and the buds are cut off with a sharp

knife, a shield-shaped bit of bark (with a little wood) being left with them. The bud is then shoved into a slit usually of T shape made in the stock and it is held in place by tying with a soft strand. In about 2-3 weeks the bud will have grown fast to the stock and the strand is cut to prevent strangling the stock. Ordinarily the bud does not grow until the following spring, at which time the entire stock or branch in which the bud is inserted is cut off an inch above the bud, and the bud thereby receives the full energy of the stock. *Budding is the commonest grafting operation in the nurseries. Budding is always undertaken in young branches, not more than one year old.*

CHARACTERISTICS OF FRUIT TREES

Now we give below a description of the best type of land and climate suited to different commercial fruits.

MANGO

A loamy soil properly drained is good. Heavy soil should be avoided. It is definitely a tropical or subtropical fruit and is extremely susceptible to frost. The finest mangoes are grown only in tropical tracts entirely free from frost, but having a plenty of moisture. It can thrive under varying conditions of rainfall and humidity provided rain does not fall during the flowering season, for it interferes with pollination. Elevations of over 2000 feet are not congenial to this fruit. The ideal conditions for mangoes are a tropical or sub-tropical tract with no rainfall, fog or dew during flowering periods, plenty of moisture in the form of rain or irrigation and absolute freedom from frost and high winds.

Mango tree is propagated from seeds but the trees do not come true to seed due to peculiar inherent peculiarities of the seed embryos. In India inarching, mar-cottage, layering and grafting are the methods employed for the propagation of mango trees. In America patch-budding was the most favoured method so far but recently it has been learnt that terminal springs 2"-3" long, if cut just when they start to flush and inserted in a flushing branch, will start growth immediately

VARIETIES

About 500 named varieties of mangoes are known. The mango fruit varies in size from little plum-like form to huge Kumrajali, which is said to attain the weight of 5½ lbs. The following few varieties are mentioned. For detailed information the reader is advised to consult the exhaustive catalogue of any big nurseryman.

ALPHONSO

No fibre, very sweet, of excellent flavour.

GULAB KHAS

A highly rose-scented mango of great merit.

PAVRI

Good, famous Bombay variety, very juicy and large fruits with a prominent beak.

NEELAM

Small fruits, skin orange coloured, flesh light blood red, pleasant flavour.

TOTAPURI

A large long fruit with firm flesh and of good quality—late maturing.

DILPASAND

Fairly large sized fruit, of good taste and flavour.

MALGOBA

Very large fruits of pleasant flavour and taste, very hard flesh of whitish colour.

LANGRA

Fairly large fruit, sweet and of good flavour.

KRISHNA BHOG

Very juicy, sweet, no fibre, weight of fruit about ½ lb.

CITRUS FRUITS

(Lemons, Limes, Oranges, Maltas, Sangtaras).

A deep bodied heavy loam, fairly rich in lime is suitable. Site with a sub-soil of gravel, coarse sand or heavy clay with high water-table should not be selected. Excellent citrus gardens are found in a very wide range of climates. It thrives in dry plains, submontane tracts. Cold climate in the hills is not suitable while the trees grow fairly luxuriantly in hot regions, but the fruit is considerably injured. Citrus fruits, particularly Sangtaras, get scorched by the direct rays of the sun, especially on the south-west side of the tree. The side of the fruit exposed to direct sun rays does not grow so rapidly as the healthy portion and becomes dwarfed, resulting in malformation. The skin adheres tightly to the flesh and dries up entirely, producing black spots. Strong hot and dry winds cause considerable dropping of fruits in the summer. Unless the gardens are well-protected against these winds, much loss is bound to occur. Sangtaras prefer a cooler climate than Maltas and cannot tolerate heat so well as the Maltas. In canal colonies people grow Maltas whereas in sub-montane districts Sangtaras are grown.

Experience of years indicates that citrus trees appear to resist frost in the following order:—

Sangtaras, Khatta, Malta, Pomelo (Grape fruit), Citron, Mitha (Sweet lime and lemon). They survive frost fairly well, except lemons, which are injured to a certain extent. Of the several varieties of Malta oranges, experience in several leading fruit farms shows Excellencies Vanille, Musambi and Dulcis varieties to be the best of all other varieties of Malta.

For orange:—Santra, Naval Orange, Musambi, Washington Naval Orange, Valentia Late, Jaffa Orange are recommended.

For Grape Fruit:—Triumph, Marsh Seedless.

For Lemons:—Italian Lemon (budded), Kagdi Lime, Ureca Lime.

As the climate of every province is quite different from the other, it is better that the prospective growers should correspond with their respective agricultural departments to know the best variety suited to a particular area.

BANANA

The banana requires a fairly humid climate, moist, deep, rich soil with perfect drainage, protection from wind, full sun and much heat. It requires plenty of irrigation and freedom from frost. Though it loves hot climate, yet some good varieties of bananas are also found growing in cooler tracts of high elevations as Nilgiris and Kodaikanal in Madras Presidency.

The roots of bananas cannot penetrate hard pan (Hard stiff soil strata) and usually hate rocks; they will endure some clay if there is no danger of sour soil or stagnant water.

On account of their top heaviness, the large heavy leaves, to say nothing of the bunch of fruits, weighing 50-57 lbs., bananas are often blown down. Therefore the planter should provide either natural (hills) or artificial (windelts) barriers from winds.

The common type of banana is an assemblage of about 150 to 200 distinct varieties, e.g., Jamaica, Johnson, Montecristy, Bangulam Pisang Rajah. The Rose, Date Bananas. The Chinese varieties are world famous.

The following varieties are recommended to the Indian growers:—

1. Put tubala—Plant short, stout, fruit yellowish in colour, 4.2" long and 3.3" in girth, skin of medium thickness and peels off readily, pulp soft and slightly sticky but of good taste and pleasant flavour.

2. Dwigosha—Plant dwarf and stout. Fruit yellow, 4.5" × 4" in size, skin medium in thickness and peels off readily; pulp delicious and of pleasant flavour.

3. M. Murtaban—Plant of medium height, fruit 3.5" × 3.5," skin thin and peels well, pulp of good flavour and sweet.

For cooking varieties Monthan, Kilandi, Basarai, Rajeli-Rajapuri (Walha), Soni are recommended.

LICHIS

It is rather a difficult crop to grow under the extreme heat of the plains. It is tender, ever-green plant and requires a well sheltered locality against hot, dry winds for its success. At a height of 2000 ft. (near Pathankot), they are more successful. They are rather exacting in cultural requirements and like a moist atmosphere, abundant rainfall or very heavy irrigation and freedom from frost. Sub-montane regions can grow it well. Calcutta, Darghapur, Dehra Dun, Green, Mclean, Rose Scented, Seedless Late varieties are recommended.

PINEAPPLE

Loose light soil is the best. Insufficient drainage, excess of lime and manganese in the soil should be guarded against. There must be a reasonable amount of humus, however, natural or applied. There must be either a slope or good depth of the loose earth for vertical drainage or else the plants must be set up high on raised beds. The pineapple can endure a shallow soil. A rainfall of 30" to 60" suffices for this crop. In India it is chiefly grown in Assam. Tropical climate and heavy rain are the main requisites.

Pineapple roots are water-shy and weak. In stiff clayey soils they are likely to form balls by growing round the stem-base. In rich, moist land they develop various fungus troubles or simply suffocate. Loose light soil is best for pineapples. Many growers spread a special kind of thick paper which laid off in 36" (some 24") strips with 5½" spaces between, is used as a blanket for the double rows. This paper does three important things:— (1) It prevents the growth of weeds and grass around the young plants; (2) It retains heat and moisture; (3) It prevents loose earth from drifting paper in leaf pockets.

Holes are made by thrusting a stake through the paper in situ. The seed plants are allowed to be set and gently and firmly held in position at just the proper depth while they are striking roots. No shade is allowed and no cover crops are needed. A spray of weak solution of ferrous sulphate on the leaves increases the yield of the fruit enormously. The yield of the fruit is worth Rs. 5,000 per acre.

The propagation of pineapple is done either from cutting like sugarcane cuttings chopped up into sections, a foot long and set loosely into the earth with one end protruding or by the vigorous bottom roots springing from the base of the old stem. Seeds of some varieties are also used to germinate. By hybridisation the U.S.A. Department of Agriculture has created a number of superior varieties, spicy, aromatic, almost fibreless, one with practically no core.

VARIETIES OF PINEAPPLE

Following are the four famous varieties in the commercial world:—

Smooth Cayenne (Pine of Hawiian origin)—Rather large stocky plant with bronzed leaves, having hardly a spine on

their margins. The fruit though not very handsome, cans well. It also requires considerable feeding.

Red Spanish — Hardy, rather small variety, capable of growing everywhere except in a swamp. It is not sweet but when ripened, has a high flavour.

Cabezona — Very good variety for high grade canning — stands shipping well.

Sugar Loaf (Pande Azucar)—Excellent for eating out of hand, medium sized, very tender. Very ripe specimen can be eaten with a spoon. The pulp is yellow. The fruit is hightly coloured, large and conical.

JACK FRUIT

It is extensively grown in India, Ceylon, Eastern Archipelago. The large fruit is from 12"-18" long by 6"-8" in diameter and is much appreciated. The tree is chiefly valuable on account of its timber which has a grain resembling Mahogany and though light coloured at first changes to the appearance of that wood.

• Jack fruit is similar but is inferior species of Bread fruit tree which is one of the prized fruits of the tropics. The fruit is about the size of a melon with a tuberculated or (in some varieties) nearly smooth surface. Many varieties with differing ripening seasons are known and thus constant supply of the fruit throughout the year is possible.

PAPITA

Papaya (Carica Papaya) is a large, succulent, rapidly growing tree. When proper conditions are provided, it often bears fruit within a year from the seed.

It is a tropical plant and grows best in full sunny situations where it is properly watered. In places of heavy rainfall, measures may be taken to drain off the water and to heap up soil in a conical form at the base of the tree. Low temperature below 50°F, retards the growth and flowering of the plants.

Soil—It thrives best on rich loamy, medium black alluvial soils. Deep clayey soils and limy soils are not good.

Sowing—It is best propagated by seeds which germinate very satisfactorily only in the rainy season (June to Oct.). The seeds should be sown on raised beds 6 ft. x 3ft. which are about 6 inches above the ground level. This ensures perfect drainage. The seed bed should be manured, and watering should be done when there is no rain. The seed takes about 3 weeks to germinate, and transplantation is done when the seedlings are 9" high.

Preparation of Ground and Plainting.—In the hot season, the land intended for papaya should be thoroughly ploughed and harrowed twice at least and at the commencement of rains, sann may be grown and subsequently ploughed in to serve as a green manure. Seedlings should be planted about 8 ft. apart. If green manuring is not given, small quantity (about 20 lbs.) of well-rotted farmyard manure should be given at the time of planting, and this should be immediately followed by irrigation. Irrigations at intervals of 8 to 10 days according to climatic and soil conditions, are necessary.

Washington variety is better than many others like Gujrat due to its superior keeping quality and flavour. Some of the other high yielding varieties are Giant Hawaii, Ceylon Long, Ranchi Mammoth and Calcutta.

In India papaya cultivator has been successful in Madras, Bihar, Bengal, Bombay and Uuited Provinces. Commercially papaya is important as a source

of papain and used as a remedy for dyspepsia. Papain is obtained from the juice of its fruit and the yield in Ceylon is 100-175 lbs. of dried material per acre. Manufacture of papain in India still needs the attention of some prospective industrialist. It is not economical to retain plantation for more than three years.

GUAVAS (AMRUD-JAMRUL)

It is a common fruit found practically in every tropical region in the world, wet or dry, high or low. Guavas are valued for their sugar-acid-pectin balance. It requires deep-boiled, light sandy loam. Excepting the high altitudes of the Himalayas, it grows practically all over the plains, as it does not appear to be very exacting in its climatic requirements. It can grow under both tropical and sub-tropical climates. Severe frost, however, injures young plants of guava to a considerable extent. Even full grown trees are injured, when the temperature goes down to about 23°F. Guavas can successfully be grown in plains as well as in sub-montane tracts provided the trees are sheltered against frost and cold winds particularly in their first 2 or 3 years of growth.

Guavas trees should be set about 12 ft. x 12ft. Some may be cut out after a few years if there is overcrowding. The modern method of propagation is to use large cuttings about 15" long, set half in the ground. Budding is too difficuit and seedage wastes a year more.

The Strawberry Guaves, The Costa Rican Guava, Chamach, Feijoa are world-famous varieties. In Bombay Presidency and else-where in India varieties like Seedless Lucknow No.24, 49, 46, Benarassi Sindh, Dholka, Nasik, Kothrud grafts, Dharwar, Allahabad Guavas are grown with success.

GRAPES

Light sandy loam is very suitable. Land should not be very fertile, otherwise growth will be prolific but fruit borne will be small. It is a plant that can grow and fruit under varied climatic conditions from the hot plains upwards to an elevation of 6,000 feet or so, provided there is no excessive rainfall either at the flowering or at the ripening time. Excessive heat, however, appears to have a tendency to produce a slightly thicker skin on the fruit. Since monsoon rains fall in July, only the early varieties have success over the plains. The Punjab has been acclaimed to be the province which can grow selected varieties. Chaman and Quetta are very famous for the best varieties of grapes.

There are several varieties of grapes. The Agricultural Departments of respective provinces in India have done monumental work in the selection of proper varieties, and the growers are requested to be in touch with these departments. In the plains only those varieties can succeed which ripen before or after the monsoon.

In the northern India varieties like Black Prince, Husaini, Motia, Muscat of Alexandria, Sultana (Seedless), Zante Current, White (Seedless) may be grown.

In the Presidency of Bombay and in the South, Bokhari, Phakadi, Pandhari Sahebi, Kali, Kandhari are grown. In the Punjab Layallpur Nos. 27, 68, 75, 76, 77, 78, 88 are recommended.

To give an idea to the growers how much paying is the vineyard cultivation, the following figures give some idea of the yield and income from various vines in an orchard:—

Seven selected varieties:—

Average yield of a plant 19.5 seers.

Highest yield of a plant 68 seers
From other good varieties:—
Average yield per plant ... 10 to 11 seers.

Total yield from 242 vines of different varieties (good and bad) =5 maunds and 27 seers.

Total income Rs. 574/-

An acre accommodates 435 vines planted at a distance of 10 feet each, so that income per acre per annum in round figures is Rs. 1,000/-.

PEARS

It can tolerate both heat and cold. It can flourish even on shallow-bodied soils having hard pan or heavy clay as a sub-soil. It can also grow on a fairly kalar soil and in short it makes its growth on soils which have been pronounced unfit for other fruit trees. Pears are grown only on high elevations (4,000-7,000ft.) of the Himalayan region. Frost and hail storm spoil this fruit. Pears of poor quality known as Pathar Nakh are also grown in plains and some of these varieties can compare in quality with the choicest varieties like Bartlett, Doyenne du Commice, Clapp's Favourite, Easter Burree, etc. grow in Kulu and Simla Valleys.

LOQUATS

Well drained, humid, loamy soil is relished. It is semitropical fruit and does best in places where the heat in summer is not excessive. Loquat requires a good deal of moisture in the soil. Excessive heat and dry winds are injurious to this fruit. Japan is famous for loquats and most of its choice orchards are situated near large bodies of water. In the plains, the success of loquat growing largely depends upon the protection afforded to it against hot dry winds during summer and the supply of water. The best home of this fruit is relatively a cool tract at an elevation of about 2,000 feet or so. Out of early, varieties, Herds, Mammoth, Lage Agra, Thames' Pride and of late varieties California Advance, Sufeda, Tanaka are recommended.

APPLES

Deep-bodied loamy soil rich in lime is necessary which should remain wet and well drained. As its roots penetrate to a great depth, the sub-soil should be free from any defect. Like pears, it is only grown on high elevations (4,000 to 7,500 ft.) of the Himalayan region. Kulu, Simla Hills, Kot Garh, Murree and Dalhousie, are favourite places for its growth in India. Tracts receiving high rainfall and not protected on all sides by high hills are subject to damage by rains and frost. Apples, of all fruits, perhaps require the coolest climate. A variety of crab apple, of the size of a big plum and of inferior flavour and slightly coarse texture, is found extensively in the *hot arid plains. This variety is a prolific* bearer and finds a ready market in the plains. Baldwi, Cox Orange Pippin, Delicious, etc., are some of the best varieties recommended for growing.

APRICOTS (ZARDALU)

The suitability of the land depends upon the stock on which the plant was grafted. It can be budded on stock of plums, apricots, peaches and almonds. The grafting on almond's stalk is most successful. The peaches' stock requires light sandy dry soil and can be grown on soil containing gravel and coarse sand.

The Apricot stock requires relatively heavy and damp soil. The plum stock can tolerate still heavier and wet clay soil. In fact, if the sub-soil is heavy and can retain moisture, only plum stock apricots should be planted. Almond

stock apricots stick on land which is light dry loam. Apricots of very good quality are grown in Haripur where the climate is mild. Apricots require a cooler climate than peaches and plums and can be grown on higher elevations. They are best suited for sub-montane tracts. Apricots on the plains are not a paying crop; they make dwarf growth and grow coarse varieties only. Early Orange and Kashmir large varieties are recommended for growing.

PEACHES

It can be budded on stock of plum and almonds but the former should be preferred provided the soil is damp and heavy. They should not be grown except in fairly cool localities. They require a relatively cooler climate than plums. On the plains, in places sheltered against hot dry winds, situated near river and protected on sides by thick growth of trees, peaches make good progress. Country variety called Alucha is grown in most places. Good varieties like Rubio-sharp's early, Wickson, etc. are recommended provided they are well protected against winds.

At Tarnah in N.W.F. Province the peach season lasts for 2½ months beginning from 1st June. Golden Jubilee ripens three weeks to a month in advance of 6A peach, the main season crop in N.W.F. Province. The fruit is claimed to be superior to Wiggins, the old early peach of the tract. J. H. Hale and Nectarine are other promising types which are special in quality.

Four irrigations one in May, two in June and one in July yield the highest returns.

PLUMS

It can be grafted on stock of peaches apricots and almonds and type of the soil depends upon the stock. Plum require a cool climate but they can be grown successfully even in somewhat warm places, provided the plantation is protected from hot dry wind and there is ample supply of water. Damson Purplish Black, Ganzily, Peshwar Nos. 1 to 9, Rubio Kelsey's Japan, Cherry South America, Climax, Excelsior varieties are recommended.

POMEGRANATES

It requires deep-bodied soil rich in lime. It is a tropical and sub-tropical fruit. Its wild varieties are found growing in some of the low hills of the Himalayan ranges. Pomegranates require plenty of moisture; therefore unevenness of irrigation particularly in summer, frequent hot dry winds, and lack of proper drainage are alleged to be responsible to a certain extent for the splitting of fruit. It appears that wherever the orchard is well-protected against hot, dry winds and is near large bodies of water, which prevent rapid changes in the atmospheric humidity, this trouble is much less severe. Kabul and Kandahar are famous for it. Varieties like G.B. No. 1, Dholka, Alandi, are commonly grown.

DATES

It can grow in all soils ranging from sandy to clayey. It can grow in moist soils unsuited for other fruits and can also tolerate fair amount of kalar but the sub-soil should not contain more than 0.5% of it. "Date requites its head in fire and feet in water," the usual proverb describes in a nutshell its requirements in so far as it needs an extremely hot and dry climate with plenty of moisture at its roots." But it must not be supposed that it will grow in water-logged areas. It can plentifully grow with success in

those tracts where fruits are not damaged by rain at the time of ripening. It makes good progress on plains in canal colonies in the southern Punjab and Karachi and Kalat and Bombay side. Dates can grow in almost every locality, even in cool places, but the fruit of superior varieties like Hallawi, Shamran, Khudrawi and Zaidi get damaged by rains. Date suckers are planted in September in the plains. In California dates are grown over extensive area by limited companies, and between the successive rows of the date trees vines are planted which fetch lucrative profits.

Date palm is one of the most paying fruits. The average yield per tree of Hillawi variety is as high as 1 md. 33 seers. The highest yield recorded per tree of Hillawi, the superior kind of dates is 4 maunds 3½ seers. Highest yield obtained from a young palm (Zaidi variety) in the Punjab Canal Colonies is 1 md. 38 seers. The least income per superior tree is estimated at Rs. 8.

ALMONDS

A considerable quantity of almonds is imported from Afghanistan in India. The price of sweet hard shelled almonds varies from Rs. 10/- to Rs. 20/- per maund whereas soft shelled locally known as "romali" fetches as high as Rs. 40/- per maund under normal circumstances.

Almond is an ornamental plant and it is planted in Baluchistan for the effect of its beautiful whitish pink to pale rose coloured flowers which bloossom freely in March and April. The almond tree is one of the earliest to blossom in profusion before the foliage develops.

In manner of growth and in character of leaves and blossoms it resembles peach. The fleshy part which is so thick, juicy and edible in the peach, is hard, thin and non-edible in the case of almonds and splits open at maturity.

CLIMATE REQUIREMENTS

It requires comparatively dry atmosphere, freedom from early frost. It is much more subject to frost injury than any other fruit tree. The greatest injury is apt to occur when the frost follows one or more days of warm weather. Irrigation of trees is resorted to ward off the effects of frost.

SOIL AND WATER REQUIREMENTS

Its roots are very deep; so it draws heavily upon the plant food elements of the soil. It is for this reason that the soil should be deep fertile and well drained, heavy clay. In Baluchistan it is a common practice of growing lucerne in between the trees until they are fairly big. Proper irrigation gives better fruit and encourages good development. It can tolerate a little alkali or other salts but not in excess.

ROOT STOCK

Most of the plants are raised from seeds but the choice varieties are obtained by budding. Bitter almond is considered for budding superior to apricots and peaches.

POLLINATION

Many varieties of almonds are self-sterile, so it is necessary to plant more than one variety in the orchard. Ordinarily one variety will pollinate any other provided the flowering periods are nearly the same so that pollination is produced while the pistiles of other are receptive. Thus interfertile varieties blooming at the same time may be grown in an orchard.

VARIETIES AND YIELD

In California the varieties grown are:—Non-Pareil, 1.-X-L. Ne Plus Ultra, Drake, Texas, Peerless, Loweling and Languedoc.

Average yield in California is reported to be 338 lbs. In British Baluchistan and Iran the yield per tree is as high as 130 lbs.

PISTACHIO (PISTA)

Its original home is Asia Minor but it is usually grown on sand stone formations in Syria, Mesopotamia and in Khorasan.

It is a small tree. Its fruit yields resin and oil and is also used in confectionery. In India we get its suplies from Iran, Palestine and other neighbouring areas.

This tree is found scattered over near Rawalpindi, Srinagar in Kashmir and there is no reason why this fruit tree can not be cultivated with success along the North Western Frontier. Only budded and grafted varieties are produced. Seedling plants usually do not bear fruit.

FIGS

Any kind of well-drained land will suit. Figs enjoy a dry and hot summer climate like that of the Punjab, provided no rain falls during the ripening season. It seems to flourish best at a place where the climate is hot and dry during the ripening season and which has an annual rainfall exceeding 25" in the absence of irrigation facilities. Figs can stand a fairly severe winter season and are grown in plains and sub-montane tracts. Even in the hills, figs grow luxuriantly and remain unaffected either by snow or frost, but the fruits fall to ripen well, owing to the rains that set in before the fruits are picked. Figs of Poona variety are recommended besides California. Turkish Purple or Turkish white varieties.

OLIVES

It can grow even in rough soils which are found relatively dry for the grapes and gritty for other fruits. But like other fruits it makes good growth in good soils. Its trees are found on hills near about Rawalpindi, Kashmir, and Sind.

Olive oil is one of the finest known oil in commerce as food and as a lubricant in wool spinning. The true olive tree is a very hardy tree, is drought resistant and thrives well in dry climates with mild winters. Loamy soils are most suitable for its cultivation. In India the olive has become established in parts of Northern India and bears fruit abundantly. But fruits drop down before maturing. Experimental work in progress indicates the Northern Punjab and the N.W.F. Province to be best suited for planting improved varieties produced as a result of hybridisation. The plant comes in bearing after 5 or 6 years and yields 2 maunds of olives and yields about 3 gallons of oil. Some of the best varieties are: Sevillano Macro Carpa, Verdale, and Hardy Mammoth. In U.P. in India olive trees have ben planted as a part of rural uplift work.

WALNUTS (AKHROTS)

It requires well-drained medium soil which should be well provided with humus to retain moisture. It cannot grow in dry places nor in water-logged areas. Like apples it is grown only on high elevations (4,000—7,500 ft.) of the Himalayan region. Kabul and Kandahar, Kulu Valley and Simla Hills grow these trees. Large, thin-shelled or oval Himalayan variety is recommended.

STRAW BERRIES

Any sort of sandy or light loam, well provided with humus, is considered good. A land which grows potatoes and maize is equally good for its plantation. These are mainly cultivated in higher elevations of the Himalayas, where the cold climate

of the hills tends to bring these fruits into perfect maturity. Even in the sub-montane tracts straw-berries are grown on a more or less limited scale, but the quality of the fruits cannot be said to compare favourably with those produced in the hills.

CHERRIES

Deep medium sandy soil is good. Heavy soil should be avoided. The roots should not remain moist. Like apples, it is grown on high elevations of the Himalayas (4,000-7,500 ft.). Simla Hills (7,000 ft.) also grow some excellent varieties. Variety resembling red berries and of spicy acid flavour is recommended.

JUJUBE (BER)

It is one of the wild growing trees of the plains. It is a very hardy tree and can stand extremes of heat and cold. It enjoys the long summer heat of the plains and relatively cool and humid portions of the sub-montane tracts. Benarsi grafted, large fruited, pulpy and delicious varieties are recommended.

FALSA (GREWIA ASIATICA)

It is grown in the plains as well as in the sub-montane tracts and can be successfully grown in canal colonies. Neither extreme heat nor dry winds injure the fruit or the tree, because even if the tree is damaged above the soil the plant gives out shoots readily, which bear heavily in the next spring.

CONTROL OF INSECTS AND DISEASES

Just as sanitary habits are important in maintaining human health, orchard sanitation is necessary as a basis for fighting orchard ills. Weeds harbour both insects and diseases, and should not be allowed to grow in the orchard, at least for long periods. During the rainy season it may be desirable to allow weeds to grow, along with any cover crop which may be planted, to prevent erosion and provide a green manure. But at the end of the season they should be completely destroyed. Not only are weeds dangerous in the orchard itself, but also in fencerows, hedges and neighbouring fields. Cultivation of the soil at some seasons tends to kill certain insects. If diseased branches are allowed to remain in the trees, they may serve as sources of infection. They should, as far as is practicable, be removed.

Plant diseases are controlled mainly by preventing or reducing infection. In most cases, once the organism establishes itself in its host, it can be destroyed only by removing the infected portion. In some cases of mildew, the mycelium, or main body of the fungus, is on or very near the surface, and can be destroyed by spraying. Bacterial disesses, once established, are particularly difficult to eradicate.

Spraying is used mainly to protect the plants from infection. The spores are well protected. When they germinate, however, they are comparatively easily killed by toxic substances on the surface on which they lie. The secret of successful control, therefore, is the coating of the leaves, tender twigs and young fruits with some material which will not injure the host, but will kill the germinating spores. Such a material is called a fungicide.

The most popular of all fungicides is that known as Bordeaux mixture.

SULPHUR FUNGICIDES

Sulphur is a very effective fungicide, and is used in a number of forms. Any finely divided sulphur may be used as a dust. It should be fine enough to pass through a 300 mesh sieve. Ground, sublimed, and precipitated sulphurs are on the market for this purpose. They are

commonly used to control powdery mildew of the grape and other crops.

A number of other fungicides have been, and are being used, but are of comparatively little importance. Among the more promising is zinc sulphate, 16 pounds of which, with 8 pounds of hydrated lime, are used with 100 gallons of water.

Small hand sprayers, similar to those sold for killing household pests, may be useful if only a few small plants are to be sprayed, but are of no value in an orchard. Garden syringes are also of little use, as they fail to form fine mist which is necessary for good spraying.

For more extensive operations, or for spraying large trees, more powerful machines are desirable. Strong pumps attached to barrels which are mounted on wheels or on drags provide higher pressure, and make it possible to spray more trees without stopping to refill.

PICKING AND PACKING FRUITS

Very sad state of affairs exists as regards picking of fruits in the conutry. Often, the grower climbs up the fruit tree and shakes the branches. The fruit falls down on the ground bruised and injured. How can such fruit keep long! Before it reaches the market, half of the so gathered fruit is spoiled and diseased.

PICKING OF THE FRUITS

Experiments were conducted by the Punjab Agricultural Department on picking of citrus fruits and it was found that fruits which had fallen from a height had very low keeping power.

Fruits should be gently picked with care. In America and other advanced fruit growing countries, rubber gloves are worn on hands and fruits picked or stem cut with a sharp knife or scissors and the fruits gently put or rolled into the knapsack made of rubber. By gentle picking the skin or the covering of the fruit remains intact. Insects and bacteria cannot penetrate through this hard resinous covering. It is only when fruit is scratched that injured part gets exposed to bacteria and other rotting agencies and the fruit gets spoiled.

Bananas and citrus fruits have chemical constituents in their skins which are poisonous to bacteria and insects. It is only when the skin ruptures that they get hold of them and spoil them. Sound mangoes if gently picked and unscratched may dry to a power rather than go bad.

PACKING OF THE FRUITS

Packing of the fruit deserves more attention than that at present given to it. One often sees the ugly sights of sound as well as unhealthy fruit packed together in dirty gunny bags or baskets. Sometimes fruits are so hard pressed that under pressure the juice keeps flowing down the containers, making the whole thing ugly and nauseating. Flies and insects keep hovering over and inside the packages. Fresh fruits should be carefully picked and packed in sound and attractive packages. There should be layers of straw or paper separating the individual fruits or bunches as the case may be. If one bunch or a single fruit is spoiled, it should not be let to spoil the rest by contact. Aeration and free circulation of air in the containers containing fresh fruit is essential, otherwise "heating up" takes place and fruit is readily destroyed. Wherever possible (as citrus fruits, mangoes, pears, etc.) the individual fruits should be wrapped with butter paper and better if first dipped in molten wax and papered. This process prolongs the life of the fresh fruit. It has been found by the Agricultural Depart-

ment of Bombay that the practice of applying melted paraffin wax to the cut surface of the stalk or freshly cut bunch of plantains is very wise.

(1) This increases the keeping quality of the plantain fruits on the bunch.

(2) The fruits remain in fresh condition for a longer period.

(3) Plantains do not drop from the stalk.

(4) Fruits get good yellowish attractive colour when ripe and no dark spots are formed.

(5) Rotting of fruits is appreciably checked.

Dried fruits should be packed in cardboard boxes or metal containers as tins. But they should be hermetically sealed with paraffined paper or wax paper. Gelatine paper serves the purpose very admirably and also it is transparent; the products looks through it.

GAS TREATMENT TO FRUIT

The boxes or containers of fresh fruit should be carefully handled. They should rather be labelled "Fresh Fruit", "With Care," so that the transport agencies should not handle such cases with negligence. In California, shippers, in order to prevent oranges from moulding, administer a gas treatment to the fruit after it is wrapped, packed and actually sealed up in a refrigerator car. The gas consisting of chlorine and ammonia is injected into the cars through the dripvents. The adventage of this proccess lies in the fact that after the fruit is treated thus, there is no further danger of contamination before it reaches its destination. If the fruit is treated before being wrapped and packed, it is likely to come in contact with mould spores during handling on the packing line-up.

GRADING OF FRUITS

Before packing, the fruit must be graded and poor quality fruits or diseased products should in no case be mingled with superior and healthy fruits. Graded and selected fruits bring more income than imagined. The common method of putting the inferior quality fruit down and sound and plump fruit on the top of the heap to cheat the customers in the Indian markets should be strongly deprecated and condemned. Packed fruit should not be placed in dirty atmosphere or unhealthy surroundings.

It is a common observation that grading counts in these days. Imported fruits find ready market because they are properly and handsomely packed and graded. Outward show coupled with the quality of the product is to be emphasized for success in the market. Things sell fast if attractively packed.

We give below a few hints on the best methods of grading the fruit that are practised in foreign countries. In America very expensive and heavy machinery has been installed for grading the fruit. But for small organizations the Fletcher-Becker Fruit Grader is used which grades by size, the apples being passed over rubber conveyor bands, in which are cut holes of the required sizes. Most of the Canadian packers grade by eye and this becomes very easy with practice. Some British growers use a table with holes. The apples are passed through and then roll down felt-lined troughs into felt-lined trays. The edges of the holes are made of linoleum in order to prevent bruising. But this method is not satisfactory as a small apple may slip into a bigger hole. The packer must grade by eye to ensure a perfect pack. In canneries automatic machines like screen graders, roller graders, rope or

cable graders or grading by weight, are used.

WRAPPING OF FRUITS

Next to grading, wrapping of the fruit is very important. Wrapping has several advantages:—

(1) The wrap serves as a cushion minimising the risk or bruising.

(2) It maintains a more even temperature in the fruit.

(3) It prevents rot and fungus diseases spreading from specimen to specimen.

(4) It gives a more finished appearance to the package when exposed for sale.

(5) It preserves freshness in appearance, and adds to the keeping qualities.

(6) The paper absorbs surplus moisture.

(7) It facilitates rapid packing.

The wrapping should be performed with as few movements as possible for every movement will be repeated thousands of times during the day. Superfluous movements tire the packer unnecessarily. The sizes of warpping paper in common use are:—

10 by 12 inches for very large apples.

10 by 10 inches for counts 56 to 96.

8" by 9" and 8" by 10" for counts 138 to 175.

8" by 8" for smaller apples.

The wrappers are sometimes paraffined to keep off moisture; sometimes they are dipped in potassium iodide and these iodised papers kill the micro-organisms responsible for the decay.

By treating warppng paper with diphenyl, orange shippers reduce spoilage of fruits in transit.

PACKING OF APPLES

Apples offer typical examples of packing and so we shall take them as an illustrative instance. In packing, diagonal lines are formed. Each fruit is packed in the hollow made by its two neighbours. There are five packs in general use, known as 4-3; 3-3; 3-2; 2-2 and 2-1. The 3-2 pack embraces 10 sizes; the 2-2 pack also embraces 10 sizes and the 2-1 pack only 5 sizes, which are for very large apples. For the smallest sizes (2-2¼ ins. diameter), the 3-3 or 4-3 pack is used and has six layers to fill the box.

Details of 3-2 diagonal packing in 10 sizes with 5 Tiers or Layers follow:—

		apples to the box.
3-2;	4-4	100
3-2;	4-5	113
3-2;	5-5	125
3-2;	5-6	138
3-2;	6-6	150
3-2;	6-7	163
3-2;	7-7	175
3-2;	7-8	188
3-2;	8-8	200
3-2;	8-9	213

Here 3-2, 5-6 means 3 layers of 5 apples alternating with 2 layers of 6 apples in the box and 3-2, 6-7 means 3 layers of 6 and 2 layers of 7 and so on.

Diagonal packing is very popular and is considered to be the standard one. Here we may illustrate by an example of 3-2 pack. The first three apples numbered 1, 3 and 2 are placed in position followed by the two apples 4, 5. The pack thus started proceeds with apples 6 and 7, care being taken that five apples are not moved from their original positions. Next come 8 and 9 after which the pack can be completed by packing 10, 11, 12, 13 and 14 diagonally, and so on until the layer is finished. Here 5 apples are required to complete one diagonal row.

While packing fruit, only one standard size should be used. Never

allow a smaller apple to fit the space left. If baskets or barrels are used, the apples are to be placed in the form of rings, layer, so that they should pack closely.

Non-returnable packages are convenient for the market. Only standard boxes approved by the Marketing Association should be used. While packing, a sheet of white tissue paper should be laid on the top of the fruits, and a thicker layer of wood-wool and clean hay is laid over all. The lid is then put on and the boxes corded (in fours). The boxes should then be labelled bearing the name and address of the consignee, the name of the grower, the name of the variety and the number of fruits in each box.

While packing in rectangular boxes made of wooden sides, the height at the ends of the finished box should be ¼ to ⅜ inch above the edge of the box with a bulge of from 1 to 1½ inches in the middle. This gives an even pressure on the fruit, when the cover is nailed on and there is a bulge of ½ to ¾ inch on top and bottom. The cover should be made of strong, thick, elastic wood about 3/16 inch thick, which will hold the pack rigid even after the natural shrinkage of the fruit during transit or storage. The bulge or crown is obtained by selecting very slightly large apples for packing in the centre of the pack. There is slight variation of the size in the grades, just sufficient to allow for creation of the bulge. Packed boxes must always be stacked and loaded for transit on their sides. This is very important.

HINTS ON PACKING OF SOME OTHER KINDS OF FRUITS

Pears: Packed similar to apples. Peach boxes or trays are used for the best dessert varieties. The fruit should be nearly ripe, i.e., in such a condition that it will become quite ripe in about a week.

Plums and Gages: In seasons of abundance larger packages may be used but chip basket is the best for non-returnable packages.

Cherries and Strawberries Currants and Ghooseberries: Special qualities are packed in peach boxes (1 lb. chip punnets of 70 cubic inches).

Peaches and Nectrine: All are nested, the finest soft white aspen wood-wool and good tissue being used through the box. The fruit should be firm and ripen three or four days hence.

Grapes and Apricots: A large wooden basket which tapers on the lower side and is called Kavara is generally used. The fruits are piled in layers with rings of grass in between and on the sides. When the fruits are to be sent very far, wooden boxes with spaces for the ingress of air, locally known as crates, are used with success. Hay or special grass is packed in it. Grapes are also sent in small quantities in small wooden boxes with cotton wrapped round the bunches.

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Manufacture of Carbon Brushes

In practically all forms of electric motors and generators, currents flow through conductors carried on the revolving part of the machine and in a majority of these machines the current must be conducted from an outside source to these revolving conductors, or vice versa. This is accomplished by small pieces called brushes which bear against the revolving surface. Copper leaf and gauze were first used for this purpose, but as the size of the machines increased, they were found to be unsuitable, as they burned and wore the moving parts in contact with them. Carbon is the only material which combines the electrical and mechanical properties required for nearly all machines. It may be and is at times combined with other materials such as metallic powers. Although the brush is small and simple in relation to the motor or generator on which it is used, the successful operation of the machine depends to a great extent upon the qualities of the brush. Poor or import brushes can rapidly ruin parts of electrical machinery, as well as cause electrical troubles.

Carbon brushes were patented in England in 1885 and came into use about 1890. At that time the limitations of metal brushes as then made for the larger sizes of machines became apparent. The chief objection to metal brushes is that it is difficult to keep the surfaces of commutators smooth when metal brushes are employed. The soft copper bars of the commutator and the metal brushes do not wear well. When soft metals are rubbed together or meet in a bearing surface, they have a tendency to become rough or to cause pitting of the metal surface. The tendency of electrical machinery, particularly direct current generators, to spark at the brushes is lessened by brushes of a comparatively high resistance material (i.e. compared to copper) like carbon or graphite, instead of low resistance metal. Brush development has followed the rapid expansion of the electric industry. Research and experimentation in the composition and manufacture of brushes have contributed to the development of electrical machinery.

The raw materials for brushes, as the result of manufacture of a wide range of products with widely varying characteristics, are greater in number than those used for electrodes. The principal raw material is petroleum coke. Others are lampblack, at times carbon black (infrequently some of the other blacks), and retort or gas carbon. Being a hard, dense material, retort carbon is sometimes employed to give a cutting grain to the brush and cause it to have slight abrasive action. Metallic powders, such as copper, zinc, lead and tin, either singly or together, are employed in the so-called metal carbon or metal graphite brushes.

Metal graphite brushes depend on the sintering of the metal particles as in the case of copper-graphite, or alloying as when zinc and tin are added to the copper-graphite mixture.

There are a few highly abrasive brushes which use a clay or ceramic bond. Graphite—the natural variety to a greater extent, being either natural flake, Ceylon plumbago or sonora (Mexico) amorphous, but also Acheson or the artificial variety to a considerable extent—is an important brush raw material.

[illegible]

All raw material used in the manufacture of brushes is checked for physical and chemical characteristics before being permitted to enter the processing. It is particularly necessary that this be done because the operations are so numerous, and the ultimate effect upon the product may be so difficult to predict every characteristic and operation conforms to the conditions set up in the development of the grade of material. Except in the case of the metal graphite and resin-bonded material, the time elapsing from the start of the process to the rod or plate ready for machining may be 12 to 14 weeks.

It is necessary to test metal powders for screen analysis, density (both real and bulk), percentage of the metal, percentage of other metals that may be detrimental, ash, or other impurities.

The cokes, lampblacks and other carbon materials are checked for percentage of carbon, volatile combustible matter, real density, ash, sometimes resistivity in the raw, calcined and graphitized forms. Graphites especially are examined carefully to determine the character of the ash. The ash of natural graphites may be siliceous or micaceous; an experienced observer can often determine the type of graphite and where it came from. The degree of graphitizition of artificial graphite is indicated by the colour of the ash as well as the amount. A brown, iron-coloured ash indicates low graphitization, and often contains some silicon carbide crystals.

Coal tar binders are tested for melting points (solid binder), benzol insoluble, ash, and coking value. This latter characteristic as determined in the laboratory gives a good indication of the amount of binder carbon which may be expected in the baked carbon material. The laboratory value approximates about 45 per cent while the baked coking value or binder carbon may be as high as 60 per cent or over, depending on the method of baking.

Resin binders are tested for viscosity, per cent of solvent, and total solids (resin) on heating. On occasion they are examined for temperature of carbonization and coking value.

Electrical calcined coke is used in furnace electrode and electrolytic anode manufacture. As usually made, the coke is partially graphitized. Electrographite calcined coke is used in furnace electrode and electrolytic anode manufacture. As usually made, the coke is partially graphitized. Electrographite flours are completely graphitized cokes.

Graphites are usually purchased ground to specifications. Commonly they are all through 200 mesh, but for some purposes a quite coarse graphite is required to take advantage of the leafing properties of flake graphites. Lampblacks and carbon blacks are already fine powders of micron size by virtue of their method of production.

The different cokes as well as the electrographite usually are ground in the carbon brush plant. A common device is the Raymond roller mill which depends on centrifugal force to apply pressure to two or more rolls hung from a vertical shaft. The coke is scraped up between the rolls and a vertical "bull" or grinding ring. Recirculating air picks up the ground coke, the finer material passing through the system to a cyclone while the heavier, too large pieces drop back through the separator to be ground small. The fineness is governed by a number of factors: size of material, density, speed of feed, r.p.m. of mill, speed of circulating

size and velocity of air through the separator. Ball mills, with or without air separation and other mills operating on similar principles are often used. Each type of mill gives a somewhat different particle size as measured by a screen. Brush engineers thus have one more variable to work with. Particle size is determined by screen analysis. A common device for this is a nest of screens of the desired mesh, used in a sieving machine. Bulk density determinations give some informmation about the amount of surface area in the coke flours. The amount of binder required is partly dependent on this factor.

Having the carbon and graphite flours prepared and the coal tar pitch ready, the flours are weighed in the proper amounts. They are usually placed in a bread type mixer having two sigma-shaped blades revolving towards each other. These are made by a number of manufacturers but the best known is the Werner and Pfleider type mixer. These mixers are steam jacketed and after the dry flours have been heated the binder is added to a predetermined amount. The binder is often added hot, in order to mix quickly, coating the carbon particles evenly without forming lumps. A uniform minimum coating of binder is desired, and to obtain this other processes may be used such as "draw plating," i.e., extruding through a many-hole die like macaroni; running through Banbury or rubber working rolls; an edge-runner mill; or more simply cooling the mix, grinding, and remixing.

Metal and metal-graphite mixes are made in the same type mixer, or perhaps more often are blended in a tumbling barrel or ball mill usually without balls. This is because it is not desirable to break up the feather structure of the electrolytic powders or to work harden or destroy the original shape of the metal particles made by other processes.

Brushes are made by either moulding or extrusion. If made by moluding, they may acquire their final shape in the "green"; if made by extrusion, they are formed into plates or rods which are later cut up. The presses are in general smaller, using higher pressures, and capable of utilizing dies that will give many other shapes than the round, square, or rectangular. As a matter of fact, extrusion is of minor importance in brush manufacture, since the baking flaws such as shrinkage cracks and laminations limited the use of extruded material. It is often found that the structure is not suited for brushes. Extruded carbon has a laminated structure. If a piece of partially cooled extruded carbon is pulled apart, the "strings" of carbon or flow lines parallel to the direction of extrusion can be seen. These will do no harm for some kinds of contacts, furnace resistor plates, rheostat plates and the like. Large moulds for casting or shaping can use this material satisfactorily. Products that require a great deal of machining cannot stand the cost of finding that a flaw has spoiled a nearly completed piece, hence the desirability of using moulded material. Extruded grades are suitable for many brushes, where the service is not too severe, and where cost is important.

If brushes are to be moulded, the material from the mixer may be fed directly to the moulding press and used as such, but generally, in order to acquire greater uniformity, the mix is allowed to cool and harden. The material is then reground, pulverized and remixed (sometimes more dust is incorporated, for a remixed material will take up more than

was possible to incorporate with the binder in the original mix).

The grades were developed to have a certain grain size, so it is necessary to grind the mix in such a way that this original particle size is not broken up. It is for this reason that impact pulverizers are preferred. Those with air separation probably give the least trouble, but when a screen is used with the oversize returning for further grinding, a more uniform product is obtained; for best results in either case, the mix flour for each large lot should be thoroughly blended.

The metal and metal-graphite mixes after blending are screened to remove any coarse particles or foreign matter before moulding.

Moulding is performed on hydraulic, mechanical, or combination presses. The machines may have single moulds and be hand operated; or may be semi-automatic, i.e., the operations are mechanical or hydraulic but manually initiated; or they can be completely automatic.

Such a multiplicity of designs is required that more are made by machining from larger blocks or plates than are moulded directly. Plate sizes usually range from ½ in. thick up to 2 in. or over; the other dimensions might be: 6 × 4 in., 8 × 3 in., 12 × 6 in., 12 × 12 in., or the like.

Carbon and graphite grades with either coal tar pitch or resin binder can be moulded cold or hot. Most material is cold moulded but some grades, because of the low amount of binder or some desired characteristic, are passed in hot moulds. Mechanical presses are always run cold, although there is no reason why the resin-bonded grades could not be hot moulded on an automatic cycle of operations.

Metal and metal-graphite grades may also be hot or cold moulded on the same apparatus used for carbon. Hot-moulded resin-bonded grades as well as metal-graphite may have the shunts moulded in, which is an obvious advantage, although the cost of the moulds for the many different kinds of brushes prevents their use except in large expensive brushes or long runs of the one type of brush. Hot-moulded material of the metal-graphite and resin-bonded type are ready for machining when removed from the mould. It is preferable, however, to oven-cure the resin-bonded grades to assure complete polymerization of the resin and to remove the phenol odour which may be objectionable.

The green shaped pieces, either as brush shapes, slabs or rods, are inspected and sent to be baked. Brush baking furnaces are usually smaller in size than those employed for electrodes. The green stock is packed in saggers, usually of refractory materials, with powdered calcined coke as a packing material. Temperatures are first raised slowly, then more rapidly after the preliminary coking of the binder. The heating schedule is predicated on the size and type of material, taking from 8 to 10 hours to 3 or 4 weeks to reach a final temperature of 1000°C. Final baking temperatures are from 1050°C. to as high as 1300°C. The length of time of baking will depend upon the furnace, its type, the charge, the method of heating, etc. Baking furnaces for production of the ordinary carbon brush are of many types, either oil, gas, or coal fired, and in some few cases electrically heated.

The baked product is heated, placed in an autoclave under vacuum and melted coal tar pitch or tar drawn in. Pressure is then applied to force the impregnant into the pores of the carbon. On rebaking, the material will have a decided increase in density and hardness.

Another method for obtainig increased hardness and density, especially on small pieces such as distributor contacts, is to gas treat them. This is done by thermally processing the pieces in an atmosphere of carbonaceous gas which is cracked in place. This results in the deposition of carbon on the pieces. The scleroscope hardness may be increased from 50 to over 100.

Metal and metal-graphite material is usually baked in saggers packed in sand or granular carbon, sometimes with the addition of copper foil wrapping, iron filings or chips, or other materials to minimize oxidation. It can also be baked or sintered in conveyor or other continuous type furnaces heated by gas or electricity, in a controlled atmosphere. The greatest uniformity is obtained with this type of furnace, for both temperature and furnace atmosphere are under control and each piece of material has identical treatment.

* Carbon materials, comprising that made with a coal-tar pitch binder with petroleum coke, lampblacks, and graphite mixtures are often found to be too hard, too abrasive, too high in resistance, and too high in contact drop. Graphitizing will decrease all of these characteristics which can be controlled to some extent by the degree of graphitization.

The baked and graphitized plates and brushes are tested and inspected carefully at many operations and given a final inspection for resistivity, density, scleroscope and monotron hardness, breaking strength, contact drop, ash, and on occasion other tests to be certain the material conforms to specifications and the requirements of the particular work it is to perform. Inspection discovers any imperfection as well as undue shrinkage or distortion.

The general [illegible] making brushes are:

1. The plates are surfaced to thickness and parallel on both sides on a Besly or Cincinnati grinder. They rae then cut in strips with an abrasive cutting wheel after which they are accurately ground to the correct thickness.

2. The strips are cut into the brush size and again ground to size.

3. The brush blanks are chamfered or beveled and the radius ground into the commutator end of the brush on shaped abrasive wheels.

4. The holes for the shunts are drilled. For rivet or bold connections these holes are counterbored.

5. In many cases the holes are copper plated or sprayed in order to obtain better contact. Sometimes silver, tin, or cadmium coatings are used.

6. The selection and design of proper shunts and methods of attachment are extremely important.

a. Tamped shunts are advantageous because they weigh less than most other types of connections, are adaptable to small or large cables, and permit the use of the maximum length of the brush. The tamping material is usually a copper powder with or without the addition of other substances such as tin powder, graphite, or material to prevent oxidation. The shunt is slipped through a hollow tamping tool which will just enter the shunt hole in the brush. The tamping powder is run slowly into the hole while the tamping tool is vibrating. This continues until the hole is full. Some tamping powder depends on a mercury-amalgam for its bond, others on the weldabikty of annealed copper powder.

Save for the most severe conditions, tamped connections are satisfactory.

b. Riveted or bolted connections are necessary to assure that severe vibrations will not loosen the shunt. Large heavy metal-graphite brushes and those that carry heavy loads require this type. The counterbores are usually copper sprayed or plated. The copper cable of the shunt is often performed into a ring through which the rivet or bolt is passed. Washers are used over the cable, and a spring washer is advisable somewhere in the assembly. To attain permanent tightness it is customary to spin hollow rivets under pressure until they the hot, or to heat the bolts or rivets during assembly. This type of connection is often clumsy-looking, adds a lot of weight, and takes up brush material that might be used on the commutator.

c. Some automobile starter and other small brushes are cold moulded on automatic mechanical presses with moulded-in shunt. They are later baked. It is difficult to preserve the original flexibility of the copper shunt, although this has been improved by the use of oxygen-free high-conductivity copper (OFHC) and the proper furnace atmosphere. Some metal-graphite grades are malleable enough so that the shunt can be threaded through a hole or laid in a groove, sometimes with tin powder, and the brush metal can be swaged or pressed tightly around it without cracking the brush.

Carbon has inherent qualities that are peculiarly suited to the needs of sliding contacts and of commutation problems. Carbon is a good conductor of electricity. Carbon can run against metal, iron, steel, copper or brass without damage to the surface. Carbon has unusual contact resistance properties that aid commutation. These characteristics explain why carbon is universally used.

THE GRADES OF BRUSHES

There are large variety of electrical machines, each presenting different problems of commutation, speed, load, etc., and to the diversity of conditions under which such machines are operated. Some designs take care of commutation largely by built-in features; other leaves much of this work to be done by the brush. As a result, the one type may use a low-drop brush and take adventage of the low brush loss to aid efficiency; the other type will require a high-contact-drop brush to get satisfactory commutation.

Each grade of brush is described by its composition and physical characteristics. These are determined by laboratory tests. The specific resistance is expressed in ohms per inch cube. The carrying capacity is the current density (amperes per sq. in.) the brush can carry without serious heating. Brushes are adapted only to ranges of commutator peripheral speeds and the same brush will not function properly at all speeds. The hardness of brushes is rated as follows:—

Scleroscope Reading.	*Degree.*
0-15	Very soft
16-30	Soft
31-45	Medium
46-60	Hard
61 or over	Very hard

Hardness of a brush is often considered an index of its abrasive qualities, but these properties are distinct. A hard brush may possess little polishing action on a commutator while a softer grade may be highly abrasive. Hardness is a function of manufacturing processes; abrasiveness depends upon the constituent materials.

Contact drop or contact resistance is the resistance to flow of current between the brush and the surface of the ring or

commutator. The contact drop between carbon and metal (copper, brass or clean iron) is materially higher than between two metals under similar conditions, and higher than that between two pieces of carbon. It is higher when the metal surface is impure or partially oxidized than when it is chemically clean. While contact resistance is frequently expressed as "volts drop" it is really a resistance property that could as well be expressed as "ohms." The importance of contact drop to commutation can be seen by visualizing a brush on a commutator as it contact two or more commutator bars. The coils connecting these particular bars are short-circuited through the brush. There is a tendency for a current to circulate in these coils. This serves no useful purpose, but generates heat, tends to spark at the brush face and reduce machine efficiency. This circulating current must pass twice over the metal-carbon contact, once from bar to brush and then back from the brush to the other bar. The useful or load current must pass only once across this same metal-carbon contact. Thus it becomes obvious that an increased contact resistance may have a marked effect on the low-voltage circulating current (generated in only one or two coils near the neutral position) with only a minor effect on the load current. There is actually twice as much resistance thus inserted in the path of the circulating current as in that of the load current.

Maunfacturers classify brushes as follows: abrasive, when the brush is capable of keeping down mica on slow speed commutators operating under severe electrical or mechanical conditions: medium abrasive, when suitable for medium speed commutators (up to 3,500 ft. per minute) under normal operating conditions; slightly abrasive, for medium to high speed peripheral speeds; polishing, where commutating conditions are good at medium and high speeds, and on slotted commutators in hard service where there is a tendency to form smut on the commutator or collecting ring; slight polishing, employed on slotted commutators; non-abrasive, such as the electrographic brushes where the wearing and polishing effect is at a minimum. The brush will cause the commutator to assume a fine glossy chocolate colour, and, if commutation be good, to remain in this condition indefinitely.

The carbon-graphite brush is usually termed a "carbon" brush. It consists principally of amorphous carbon (calcined petroleum coke) with sufficient added graphite to increase its conductivity and lubricating properties. Natural graphite is generally used. Since this material contains appreciable ash, this type of brush will have considerable abrasive action.

Manufacturers and users commonly impregnate carbon brushes with lubricants to reduce friction, temper the abrasive action and improve commutation, due to the contact resistance caused by the film of lubricant at the brush face. At high temperatures such brushes lose the lubricant. They show a tendency to collect dust which may be of an abrasive nature, as well as to collect copper on the brush face.

"Carbon" brushes are within the medium range of hardness, of low carrying capacity, and not adapted to high peripheral speeds. They are employed on flush mica commutators, not being adapted to slotted types due to their abrasiveness and lubricants.

APPLICATION OF HORMONES IN THE CITRUS INDUSTRY

It has been found that certain organic chemicals are capable of altering plant growth in various ways, many of which have great economic value. Generally these substances are used in very small quantity or at relatively low concentrations to produce the desired physiological changes in plant growth. Two plant growth regulators, viz., 2, 4-D (2, 4-dichlorophenoxy acetic acid (and) 2, 4, 5-Trichloro Phenoxy acetic acid) can be used for increase in size of oranges and lemons and also for preventing pre-harvest crop of fruit. It has been found in California that a single spray application of 2, 4-D to orange and grape fruit trees a few weeks after bloom has, resulted in an increase fruit size of the fruit just set. If mature fruit is also on the trees it will be effectively treated for pre-harvest drop but will not show any response in size. Fruit excessively stimulated with 2, 4-D have thick rough peels and the pulp is coarse and tough though the T.S.S. and acid contents are not affected. This spray prolongs the period of fruit development and thereby delays maturity.

2, 4, 5-T is still in the experimental stage. Preliminary results however, show that it has similar wholesome effects on Valencia oranges and spray approximately one-half as concentrated as for 2, 4-D may result in the same increase in fruit size.

STUDIES ON BALANCED FOOD

To supplement the poor diet and to provide a cheap nutritionally adequate food has been developed from tuber flour and oil seed cakes, Tapioca and such tuber crops grow well under diverse soil condition and produce a very high yield of edible carbohydrates per acre but are deficient in protein. Oil seed cakes, from groundnut, sesame, copra, etc., presently used for cattle feed and fertilizer, can be used as a cheap protein by careful grading and cleaning of the seeds and by removal of the rancidity causing oils by treatment with boiling alcohol. A mixture of 63 % tapioca flour 30 % groundnut cake, 2 % yeast, 1 % dehydrated carrot powder and 4 % salt, condiments, and flavouring agent prepared to look like rice is fairly palatable and when fed to rates produce an average weight gain per week per rat of 9.5 gms. as compared to 4.8 gms. in rats fed to the poor south Indian diet.

(Chem. Abst., Dec., 10, 1952).

ORANGE A SOURCE OF PROTOPECTIN AN IMPORTANT HEALTH FACTOR

Our age old method of peeling oranges so as to remove all the sticking white protion (albedo) from the segments has been recently questioned in the United States. They advocate only partial removal of the meaty solids as this as well as the wall of the segments and juice sacs have been found rich in an important health factor called protopectins. These remarkable substances improve your digestive climate. They remove many harmful bacteria from the digestive tract and encourage the friendly types to grow and flourish. Thus they help prevent many digestive ills and upsets when your digestive system does become over active and irritated or when it grows sluggish the help it regain normal action. The protopectins are especially important for children for old people and for every one

... nervous and upset due to the tempo of this modern age.

... GRAFTING IN EIGHT WEEKS

Following is the description of a successful technique tried at Saharanpur, U.P., India. Mango stones planted in early ... started germinating at the end of the month. Seedlings were 1 ft. high and 1¼ inches in diameter 30 days from germination. One hundred such seedlings including stones and sprouting roots were lifted and the soil clinging to the stones was removed. The stones were covered with wet sphagnum moss ½ inch thick held in place by a thin string. They were taken to the parent tree and inarched with new shoots of the same thickness in early September. Rapid union took place, and at the end of the month the grafts were detached from the mother plants and potted. Eighty per cent success was achieved. The whole operation took place during the rainy season, rain water absorbed by the moss affording all the moisture necessary.

MEASURING PAIN IMPULSES

For many years scientists have made elaborate studies of pain. One technique uses heat to the point of feeling pain: another uses cold, or freezing, to produce the feeling. According to a 'Newsweek' report, Dr. W. K. Livingstone Professor of Surgery at the University of Oregon, in co-ordination with Dr. John Brookhart, physiologist and Dr. Frederick P. ...gen, anesthesiogist has been conducting a pain clinic, where patients with pains highly resistant to treatment are studied. In their test, Dr. Livingstone and his associates use anestheitized cats administering pento-barbital and then applying electrical stimulus to the tooth pulp of the animals. With the aid of an oscilloscope and a synchronized motion-picture camera, they can see and record impulses on the brain which would be painful to the conscious animals. In his pain research, Dr. Livingstone has learned that while virtually everyone has experienced pain, many of the popular concepts concerning pain do not apply. Some of his discoveries, described in the March "Scientific American." are:

Gunshot wounds, which most people consider to be highly painful usually are not. The impact of the bullet frequently serves temporarily to paralyse the conduction of nerve impulses. Superficial wounds are more painful than deep ones because there are more sensory nerve endings in the skin than in the deeper tissues of the body.

Although most pain is proportional to the injury, there are notable exceptions. Some people have skin so sensitive that the slightest touch will cause agony; on the other hand, a child may be born without a normal susceptibility to pain, and can injure himself repeatedly without knowing it.

A certain amount of stimulus applied to a certain part of the body does not equal a certain, predictable amount of pain. Dr. Livingstone has found that previous suffering can lower the paintolerance level in some cases, and that sensitization can be created by constant and recurring pain.

A patient can modify pain through his interpretation of it . For instance, a boy who is slapped by his father will look at his father's face to see if the blow was delivered in fun, or was meant as a reprimand. If in fun, the child will laugh; if as punishment, he may decide that the blow hurt and he will cry.

A dying man does not feel pain. "Before all his senses fail, before he loses all power of speech and movement,

before his nerves lose their capacity to transmit pain signals, the ability of his brain to translate these signals into pain perception has been lost," said Livingstone "For pain is a product of consciousness in which the essential element is awareness."

LAC RESEARCH GIVES CLAY POT FOOD STORAGE ROLE

The Indian Lac Research Institute at Namkum has worked out a process which will help feed Indian's people in the lean months of the year. Also, it might well start a new cottage industry.

Its researches have made possible the adaption of the traditional Indian earthenware jar for preservation of food.

The Institute has shown that earthenware—which millions of Indian villagers use for storing their grain and provisions, and for cooking their daily meal—when given a coating of lac, makes these pots impervious to water and proof against fermenting bacteria.

No more need the oil ooze out from the poor man's pot, or his salt percolate through, by attracting moisture from the humid air outside. Salt, mineral and vegetable oils, and pickles stored in coated pots have remained "put" for over six mounths.

The shellac-coated (shellac is the commercial product of lac) earthenware not only wears a new and brighter look, but it also is resistant to the action of hot water, common salt, and oils. Because of lower costs, the "new pots" might well be able to compete with utensils made of stone, porcelain, and glass.

The process of coating earthenware is simple and does not require any expensive equipment. The preparation of the varnish and making new pots out of old might well start a new cottage industry.

The Institute also has carried out numerous investigations for improving thi performance value of shellac products—lac is important in plastics, electrical adhesive, leather, wood-finishing, hat, an several other industries. The gramophon record industry provides the largest singl outlet for shellac consumption.

It has made improvements in th application of shellac in the varnishin and polishing industries, and, as a resul of these researches, several new uses hav been found for shellac.

A combination of shellac with caseir and vegetable proteins has opened a new vista in plastic moulding. Laminatec boards of good insulating performance have been prepared for application in the production of electro-technical goods. The Institute has also evolved shellac moulding powders suitable for the manufacture of electrical switches, sealing waxes, bottle caps, bangles, jewellery, and other utility articles.

The Institute, started in 1925, covers an area of 130 acres. Its various departments devise improved methods of cultivation, find new ways to better the quality of lac produced, discover new methods to minimize the effect of insect enemies, and constantly seek to widen the range of utility of lac through chemical and physical researches.

It is interesting to note that India, by producing 40,000 tons of lac a year, virtually holds the world monopoly (almost 80 per cent) in lac production—lac is a resinous substance secreted as a protective cover by a tiny bug, scarcely more than one-fiftieth of an inch long (16,000 insects produce 1 lb. of lac), having its habitat on certain trees, shrubs, and creepers.

Engineering Notes

Manufacturers and Suppliers are invited to give notice in this paper of new products or developments. Description should be brief and blocks or stereos not more than 2½" wide, 85 screen for halftones.

PLYWOOD ENGINEERED WOOD

Plywood has evolved during the past 100 years. A basic description, which is quite inadequate from the viewpoint of to-day, is: that plywood is an assembly of thin layers of wood, in which alternate layers are arranged crosswise, the whole being firmly glued together. In 1840, an American by the name of John Dresser patented a primitive rotary lathe for cutting thin sheets of wood, which were then called scales or scale board. Apparently, however, the lathe was quite unimportant in the woodworking of that era.

About 1850, thin sheets of wood—which we now call veneer—could be made only by hand, and the small supply which was availible was irregularly cut and costly. One of the few forerunners of true plywood was the pin block—or wrest plank—in a piano, made about 1830, of several crossedlayers of thin-sawed maple lumber glued into a rigid block. Though the term "plywood" did not come into use until 1916-18, these pin blocks, into which the turning pins were fastened, were of plywood construction, since they had dimensional stability. They have been standard construction for all pianos ever since.

Passing over the year of slow early development, one comes to the period of 1930 to 1950, which revealed more development, in plywood than any early period of similar length. The major factor was the perfection of synthetic resin adhesives and of hot-pressing, resulting in waterproof plywood. This immeasurably broadened the field of utilization for boats, aircraft, and prefabricated housing.

Tego film, the pioneer of the phenol-formaldehyde resin adhesives, was imported from Germany in 1933, and was first made in this country by Rohm and Haas in 1937. Closely following were the ureas, the melamines, and the resorcinols—all of them synthetic-resin adhesives ranging from high water resistance to complete water-proofness. Some of them were supplied with catalysts for hardening at room temperatures, but the most durable proved to be the hot-pressed phenilic plywood. Some of the multi-opening hot presses of the blood-albumin era were "dusted off"; and by 1940, more than 100 hot presses were in service—both in plywood factories and in shops making furniture, pianos, doors and general cabinet work.

Various blends of adhesives have developed: such as phenolresin-blood, urea-resin-flour, resorcinol-phenol-resins, and melamine-urea-resins. This evolution has improved the moisture resistance of plywood joints, and at a cost which is reasonably competitive with that of joints which are fabricated with glues. All this greatly benefited the Douglas-firplywood industry, which was now able to produce an "exterior" type of plywood (phenolic) that was the ultimate in water resistance.

Moulded plywood, with omni-directional pressure from flexible bags, was an important development in the years 1939 to 1945, and provided plywood of com-

[illegible] for the hulls of small boats; for the fuselages, nacelles, and wings of aircraft; for radar and communication equipment; and the like. It provided an entirely new range of plywood designs, though its commercial importance is limited. In its place, cushion pressure—with thin, inflatable bags between pairs of rigid moulds—finds practical use in the furniture industry and in allied industries.

Laminated lumber employs many of the techniques and adhesives which are used in plywood, and it has profited by the advances made in that industry. Laminated timbers belong in the lumber-fabricating field, whereas laminated veneers—with the direction of the grain parallel in all layers—are best made in plywood shops. This veneer-laminating procedure provides a simple alternative for difficult bends and curves in solid lumber, and has been found useful and not expensive for furniture, auto-bodies, boats and sporting equipment.

The newer materials and processes make it possible to increase the density of wood under high pressures. Hardwood equivalents can be made of impregnated softwoods, and the excess density can be localized as required. Variations are: plywood-plymetals, with inner or outer layers of metals for severe service, as in truck bodies; paper or fibre-faced plywood for smooth dense surfaces for painting; plastic-faced plywood for decorative and utilitarian purposes; and inner or outer asbestos layers for fire protection.

Electronic heat for curing resins was developed in 1942-47, the time of cure for these highly water-resistant adhesives being thereby shortended. Heat can be concentrated at the glue joint, with the consequent eliminition of an application where it is not needed.

One of the possibilities for improvement is in the cultivation of the original trees. Veneer and plywood must be produced from long, straight logs, and the present availability of these is largely a matter of chance. Farmers have long known how to irrigate and improve the yields of their crops by selecting sturdy and quick-maturing hybrid types. Therefore, improved crops of trees which are suitable for veneer and plywood can be planted and grown by similar successful methods.

There is far too much handling of semi-processed plywood material between the log in the pond and the sanded plywood panel which is ready to be shipped. With the cost of labour and material rising, there is need for more mechanical hand-ling in integrated machines, in which several sequential operations follow one another automatically. Such combinations as lathe to spicer, and continuous roller pressure, with incorporated heat for caring synthetic resin adhesives, seem logical.

NEW BRITISH DIESEL ENGINE

The latest addition to the range of Diesel engines produced by F. Parkins Limited of Peterborough, the R-6, was shown in public for the first time at the Amsterdam Commercial Vehicle Exhibition on April 23. It was also demonstrated at the Canadian International Trade Fair in Toronto in June and overseas during this year.

Announcing this on the occasion of his firm's (shalrman) said the R-6 had been thoroughly tested over the last two years both at home and abroad. It had emerged from these tests "most successfully".

The R-6 a six-cylinder unit with 4½ in. stroke and 4 in. bore, has a 340 cubic

inch piston displacement. The engine incorporates the Perkins patented "Aero-flow" system of combustion, as do the "P" and "L" series engines. The main big end bearings are pre-finished and are replaceable in service without the necessity of carrying out boring or scraping operations.

Press-button cold starting is instantaneous by means of two series-connected 12-volt batteries, and for exceptionally cold conditions, heaters are incorporated in the induction manifolds. Wherever possible aluminium die castings are used. Particular attention has been paid to cleanliness in respect of air, lubricating oil and fuel.

Perkins' new factory at Peterborough, formally opened in in 1947, produced its 100,000th multi-cylinder Diesel engine last September Over 70 per cent of the output has been exported.

FLAME-PROOF SAFETY TORCH FOR INDUSTRIAL USE

Weaterproof and flame-proof, a new battery torch, evolved for industrial purposes, has been designed to operate with safety in mines, cellulose-spraying plants, garages, gas works and oil tankers.

The case is made of aluminium alloy. Armourplate glass forms the front lens, which is cemented in a screened ring, eliminating rubber gaskets, and is additionally protected by two stainless-steel blades. The labyrinth switch affords easy action, with absolute safety. A feature climed to be particularly useful in marine work is the hexagonal head: this prevents rolling when the torch is laid on its side.

MILK BOTTLE-CAPPING MACHINE

A synchro-strip milk bottle-capping machine, claimed to be the first of its type in the world, has been specially designed for the U.S. market by a British firm, and was exhibited to the public for the first time at the Dairy Industries Exposition at Chicago recently. This cappping machine, the firm states, is the only one which can be linked up to any make of filler and give high-speed capping from synchro-strip, pre-printed foil. The action of the machine is to synchronize the cutting of the caps from the reel of foil with the exact places on the foil in which the dairy name has been pre-printed; the machine then applies the caps to the bottles at any regulated speed up to 8,000 an hour.

WATER FILTER FOR HOME AND DARKROOM

A new water filter exhibited recently in London is of interest to amateur photographers. Actually designed for ordinary domestic use, it successfully removes from mains supply foreign matter in the form of rust and other suspended particles, chlorine or any similar chemical used in water-sterilization. The filter improves taste and prevents staining by suspended solids.

Use of filtered water for the making of photographic chemicals will preclude loss of definition, particularly in the case of enlargements, where particles which adhered to the emulsion of the film are magnified many times over. The filter, which is robustly made and is supplied with filter cartridges, is easily fixed to an ordinary ½in. tap.

PAKISTANI NEWS

Everywhere in Pakistan to-day hopes seem to have risen high that all her disputes with India will be settled in the near future. A settlement of all such outstanding disputes is considered urgent in as much as an atmosphere of peace and amity in both India and Pakistan alone can lay the foundations of their future progress. As long as the Indo-Pakistani cold war continues, both will have to waste a lot of time, money and energy on arming themselves against each other. But peace returning, both can pursue the more important task of strengthening their economy. Not only India and Pakistan, but foreign powers who want them to come into their own as progressive nations are urging that they should settle their disputes and establish good neighbourly relations. But the problems which have worsened relations between the two Staes, are too many and then each of these problems taken singly is quite of a formidable nature. First, there is the knotty Kashmir question followed by what is known as the canal water dispute. Evacuee poperty and the status of minorities are two other difficult matters. There may be umpteen others. The note of expectancy which is now in the air, however, is no mere wishful thinking. Steps still remain to be taken to bring about a settlement, but the informal talks between Prime Ministers Mohammed Ali and Nehru, recently held in London, need to be assessed in a correct, though cautious, manner. The talks are just the first step towards a settlement, but the statements. made by both statesmen to pressmen amply prove the sincerity of their desire to do the needful.

Some in Pakistan are asking for the devaluation of their rupee. They think that it will provide a fillip to their country's exports. As all available reports show, the foreign trade position of Pakistan on private account has now turned out to be favourable and there has been a marked recovery in the prices of raw jute and cotton, the two well-known earners of foreign exchange. The balance of trade on private account for 10 months upto January, 1953, was favourable to the extent of Rs. 34.72 crores. But confronted by a shortage of foodgrains Pakistan has had to spend heavily on the import of wheat and other foodgrains. In the beginning of 1952, her foreign assets stood at Rs. 150.52 crores, but as on May, 8th, 1953, they came down to only Rs. 80.94 crores.

* * * *

Pakistan's biggest headache to-day is her acute food scarcity. Recently, the Governor-General, Mr. Ghulam Mohammad opened the Khesgi Lift Irrigation Scheme, near Nowshera, Peshawar (N.W.F.P.). In the course of his address on the occasion he expressed the hope that his countrymen would put in efforts to remove the threat of famine which now confronts them. He combated the view that Pakistan formely used to have a very large surplus of food. The fact is that her previous surplus was very small and long-continued droughts have adversely affected that position. In a sense, this temporary shortage has knocked people out of their complacency bred in false notions and so has done them some good. The Food Minister, Mr. Khan Abdul Qayuum Khan, declared, "Pakistan will be sellf-sufficient, or even surplus, in one or two years." In

support of his optimism he made a reference to the series of schmes undertaken by the State, such as the Karram Garhi, Khagi, Warsak, Lower Sind Barrage and Punjab Tubewells Scheme, besides the construction of new canals. The Food Minister spoke highly of the Government's efforts to grow more food. He appealed to the cultivators not to grow more sugarcane or tobacco or cotton than what was strictly required, but to divert land to food growing. Pakistan has already procured from abroad 500,000 tons of wheat and is expecting a million-ton aid in foodgroins from the USA.

* * * *

The U.S. Food Survey Mission which recently visited Pakistan to make an on-the-spot study of her food shortage, has reported to Washington that the country is approaching a very critical period in her national economy. The Mission has pointed out that Pakistan's own efforts can hardly be expected to tide her over this crisis and that the need for substantial outside assistance is urgent. Quite a number of Americans want their Government to make a loan of 1 million foodgrains to Pakistan. There are others who want the food aid to be a gift.

A recent Reuter message is being reproduced below to show that even President Eisenhower desires to help Pakistan on to her feet by providing her with a very larg quality of wheat:—

President Eisenhower asked Congress to make possible the shipment to Pakistan of wheat up to one million tons from the USA.

In a message to Congress, he said Pakistan urgently needed 700,000 tons of wheat for famine relief.

He proposed that Pakistan pay for wheat in counterpart funds to be placed under joint Pakistan-U.S. administration for development purchases, particularly towards increased food production, to lessen the danger of future shortage in Pakistan.

Mr. Eisenhower added: "To provide sufficient U.S. aid in time it is imperative that the grain begin to move from U.S. ports by the end of this month.

"The spectre of famine confronts the people of Pakistan at a critical time in their growth as a young free nation. Unchecked, it could undermine the very democratic principles and institutions to which Pakistan is dedicated."

Mr. Eisenhower said the crisis was largely a result of a "calamity of nature." Pakistan was self-sufficient in food until severe drought in two successive years struck the wheat-producing area of West Pakistan. Today Government wheat reserves had fallen to vanishing point.

TRADE WITH SOMALILAND

Italian Somaliland is showing interest in the purchase of Indian cotton textiles —mostly in small quantities. If our manufacturers and exporters so desire they may open trade with that new region. At present, there is no direct shipping facility from India to Mogadicio and the importers there get their supplies of Indian textiles mostly through the Aden markets. Not only cotton textiles, other Indian manufactures too may find a market in Italian Somaliland, if efforts are made in right earnest to persuade the consumers of that country to buy our goods.

SURVEY OF INDUSTRIES

The Government of India has decided to set up a small committee of officials and private engineers to undertake a survey of installed capacity of industries in this country. The data to be collected by the Committee will enable the Government to determine what type of foreign experts would be needed to undertake the overall enquiry envisaged by the Commerce Minister.

TARIFF COMMISSIONS RECOMMENDATIONS

The Government of India has accepted the Tariff Commission's recommendations that (1) there is no case for the grant of protection to the flax goods industry; (2) an increase in the rates of import duties on flax goods is not warranted; (3) the existing import duty on flax both "line" and "tow" should be abolished and (4) there is no case for the refund of duty already paid on imports of flax fibre.

EXPORT OF SILK WASTE

Recently, the Government of India announced removal of all quantitative and other restrictions on exports of silk waste of Bengal and Assam origin. The silk waste of Mysore origin has thus been left out. Incidentally, it may be noted that the Government of India has released a quota of 200,000 lbs. of Mysore and Madras silk waste for export of the trade from ports in Madras State during 1953.

The above plea is based on the ground of surfeit of supplies. The aggregate production of silk waste in the State of Mysore is estimated at as much as 1,400,000 lbs. per annum, against the 600,000 lbs. that the manufacturing concerns are actually capable of consuming. This surplus of stocks thus available for export is stated to be of the order of nearly 800,000 lbs.

LOAN FOR FARTILISER

The Government of India has granted short-term loans aggregating about Rs. 2,90 crores to 10 State Governments to finance the purchase by them of the allocations of fertiliser from the Sindri factory. The loans granted to individual States are: West Bengal Rs. 7 .60 lakhs; U.P. Rs. 60.45 lakhs; M.P. Rs. 31.90 lakhs; Bihar Rs. 31.81 lakhs; Hyderabad Rs. 27.89 lakhs; Rajasthan Rs. 17.89 lakhs; Mysore Rs. 16.75 lakhs; the Punjab Rs. 11.05 lakhs; Assam Rs. 7.97 lakhs; P.E.P.S.U. Rs. 6.76 lakhs; and Madhya Bharat Rs. 4.53 lakhs.

FUMIGATION OF PEPPER BEFORE EXPORT

The Government of India is reported to have under its active consideration a scheme for fumigation of pepper before export. This is a sequel to the series of complaints made by importers in the U.S., the chief customer for India's pepper, that the consigments of Indian pepper contain live and dead insects, rodent excreta, etc. Consequently, the U.S. Food Administration has been condemning, every year, numerous shipments of pepper from India. As an immediate remedy against infestation, the Government of India is, as already stated, considering a scheme for providing facilities for fumigation of pepper before export.

EAST INDIA COTTON ASSOCIATION LIMITED, BOMBAY

The following are extracts from the speech of Sir Purshottamdas Thakurdas, President at the thirty-first annual general meeting of the Association:

"The year for which the report is before you has been in some respects an exceptional one. With the experience of the previous two seasons, the Textile Commissioner's office had made preparations for exercising control in a more stringent manner, but in cotton, history did not repeat itself. There is a useful lesson in this for those who plan in respect of commodities and prices. Within two months of the running of the season in Madhya Pradesh, the nominee system had to go, and further in Broach and Surat the nominee system, so carefully devised, had to be given up, Measures had been taken to prevent the apprehended rush of buyers on cotton, but exactly the contrary happened; and in February March this year cotton, far from piercing the ceiling, threatened to—and some Places in the interior actually did—go to the "floor', with the result that an entirely different set of measures had to be devised to remedy this situation. The complicated and unworkable licensing system with the categories of A,B,C had to be given up. Quotas to mills had to be liberalized rather than Textile Commissioner's staff has to go out persuading the mills to take up the quotas, etc. The latest phase has been that Government have made up their to relax the control on cotton. I have already had to say something about this before now. One would have thought that everybody in the cotton trade who had no personal interest to serve would approve of and support this step of Government, but as in everything else, there were vested interests in favour of the continuation of control, which were created by the control itself. In spite of the objections which may have been raised by such interests, it is some consolation that the Minister in charge and the Textile Commissioner have been firm in their attitude and have substantially relaxed the control on cotton and also permitted trading in Hedge Contract. The absence of this latter facility has amply demonstrated how the smooth marketing of the country's cotton crop has suffered in the past on this score. I have however, thought fit to take the first opportunity of cautioning the trade here and all over the country that any lapse on their part would be exaggerated and made much of by vested interests. I repeat that warning again with all deference.

"Attempts to bolster up the handloom industry by means of such remedies as a cess on mill cloth remind of the time when the khaddar movement was at its height under the inspiration of Mahatma Gandhi and the people were so enthusiastic that they wanted to export all mill-made cloth and all stocks of foreign cloth lying in India. In spite of the best efforts of a very strong committee with no less a person than the late Mr. F.E. Dinshaw on it, the idea had to be given up and those who backed it lost money. Attempts to support the handloom indusry by handicapping the textile industry appear to me to be self-defeating in their nature, as sooner or later a crisis is bound to overtake the textile industry, partly owing to the increasing imposts heaped upon it.

"It may sound inspiring to talk of being patriotic and help the masses, but

I very respectfully venture to warn the Government of Madras and the Central Government that they are now beginning to burn the candle at both ends, one by experimenting in prohibition and the other by trying to experiment to revive the handloom industry on mere sentimental grounds.

"It has taken India the best part of half a century to be a respectable competitor with Lancashire and other countries regarding the quality and outturn in piecegoods. I think it would be a definite disservice, most short-sighted if I may say so, if the textile industry is to be artificially put back or rather pushed back on any ground. What the handspinning and weavig industry needs most is, well considered and sustained guidance in devising their administrative machinery, particularly in regard to finance, methods of production, and marketing."

PLEA FOR FREE SUGAR TRADE

Speaking at the eighth annual meeting of the Bombay Sugar Merchants' Association held at Bombay Mr. Meneklal Ujamshi, President of the Association. deprecated any tendency on the part of the Government and the factories to monopolise sugar distribution. Mr. Ujamshi voiced this criticism in reply to the statement made by the Union Food and Agriculture Minister, in the course of the latter's address at the recent meeting of the Indian Sugar Mills' Association, that the Government would sympathetically consider any scheme that might be offered by millowners for marketing sugar. Recalling the bitter experience of the consumers a few years ago, as a result of the antisocial activities indulged in by the Indian Sugar Syndicate, the President urged the Government not to encourage any monopolistic organisation for sugar but to smoothen the course of free trading in the commodity which has just begun after a lapse of nearly 10 years. He is not alone in holding that view and we have ourselves emphasised, on more than one occasion, the need for leaving the sugar industry and trade to adjust themselves to the laws of supply and demand. Surely, that will go a long way towards stabilising sugar prices.

Alleging that false grading and marking of sugar by certain factories still continued, Mr. M. Ujamshi said: "During the last three months, whatever sugar produced in the 1951-52 season has come in the market and inspected, shows that a large part of it has been falsely graded. Some mills do not put any marks or grades on the bags, although it is an offence not to put proper marks on the sugar bags. It is for the Government to confiscate such sugar as it is not marked qualitywise or is fraudulently graded. They should also levy heavy penalties for such offences. Unless the Government passes suitable legislation to enforce the abovementioned penal measures, these malpractices would continue. There is an Excise Inspector for every factory. It should be made statutorily compulsory for the factories to obtain a certificate from the Excise Inspector as to quality, whilst taking the sugar out of the godown and to despatch it to the buyers with railway receipts. The non-observance of the above procedure should be made a legal offence."

What made Mr. Ujamshi to be bitter against such mills was their refusal to grant a survey of sugar of defective quality, making it difficult for the trade to prove its claim in a court of law. He, therefore, suggested that the trade itself should establish an independent Arbitration Board and intimate the mills, when they buy sugar from them, that any complaint about the quality of sugar would be surveyed by this Arbitration Board."

Balmer Lawrie & Co., Ltd.

The directors of the above Company (Director: O. T. Jenkins, Esq., Calcutta) submit the audited accounts of the Company for the year ended 31st December, 1952.

Turnover in 1952 was below the high level achieved in the previous year and gross profits were correspondingly reduced. From April onwards the first signs of a recession in business began to appear. The full effect of this is likely to be felt in the current year. Tea prices also fell steadily throughout 1952 and all the Company's tea interests were more or less affected. An indirect sufferer from the slump in the tea industry was the British India Electric Construction Company which lost its market for tea machinery. In common with other engineering concerns this Company also found difficulty in disposing of its electric motors and centrifugal pumps. The other two subsidiary Companies had a satisfactory year. The Bengal Paper Mills and the Indian Galvanizing Company were on strike from October and November respectively. Both disputes have been settled. The Indian Galvanizing Company's new plant in Bombay is now complete and ready to run.

The profit for the year, after providing for depreciation, taxation and an appropriation to property reserve was Rs. 13,45,999 (Rs. 21,96,338), to which is added the balance brought forward from 1951 of Rs. 5,19,159 (Rs. 3,97,996) making a total of Rs. 18,65,158 (Rs. 25,94,334). Out of this total, the directors paid the preferential dividend on the ordinary shares amounting to Rs. 1,50,035 (Rs. 1,50,035) on 20th October, 1952. They have transferred Rs. 6,00,000 (Rs. 10,00,000) to the reserve fund, leaving a balance of Rs. 11,15,123 (Rs. 13,19,229) available for distribution, which they recommend to be dealt with as follows:—

Final dividend of 7½ (10) per cent. on the ordinary and deferred shares Rs. 3,00,052 (Rs. 4,00,070), bonus of 7½ (10) per cent. on the ordinary and deferred shares Rs. 3,00,052 (Rs. 4,00,070) and balance carried forward Rs. 5,15,018 (Rs. 5,19,159).

The directors did not consider that they would be justified in maintaining the dividend at the increased rate, made possible by last year's exceptional results. They have made the usual substantial contribution to reserve.

Jay Shree Tea Gardens Ltd.

The directors of the above Company (Managing Agents: Messrs. Birla Brothers Ltd., Calcutta) submit the audited accounts of the Company for the year ended 31st December, 1952.

After providing depreciation amounting to Rs. 10,493 (Rs. 2,99,374), a balance of Rs. 1,12,743 (Rs. 2,10,125) remains at the credit of profit and loss account. To this has been added Rs. 70,905 (Rs. 95,056) being the balance brought forward from the previous year and also Rs. 1,00,000 (*nil*) transferred from the reserve fund to the profit and loss account. Thus there remains Rs. 2,83,469 (Rs. 3,05,181) at the credit of profit and loss account which the directors recommend be dealt with in the following manner:—

To transfer to reserve for contingencies Rs. 25,000 (*nil*), to pay dividend on 3,90,460 ordinary shares at 6 (6) per cent, per annum free of income tax Rs.

2,34,276 (Rs.2,34,276) and to carry forward the balance of Rs. 24,373 (Rs. 70,905) to the current year's account.

The directors regret that the result of the period under review is not satisfactory. This is mainly due to the fact that the prices of tea during 1952 were extremely uneconomic. Since the last few months, however, the market has taken a turn for the better and the position now seems to be fairly satisfactory.

The directors have given mature consideration to the question of payment of dividend. In view of the satisfactory financial position of the Company and fair prospects of the current year's working, the directors recommend that the dividend be maintained at the previous level of 6 per cent.

Bengal Bhatdee Coal Co., Led.

The directors of the above Company (Managing Agents: Messrs. Andrew Yule & Co., Ltd., Calcutta) submit the audited accounts of the Company for the half-year ended 31st December, 1952.

After providing Rs. 8,175 (Rs. 4,225) for depreciation, Rs. 4,000 (Rs. 5,000) for taxation and bringing in Rs. 9,000 (nil) from the taxation provision account no longer required, there is a balance of Rs. 10,786 (Rs. 8,769) at the credit of profit and loss account from which the directors recommend payment of a dividend at As. 2 (As. 2) per share absorbing Rs. 5,617 (Rs. 5,617) leaving to be carried forward the balance of Rs. 5,169 (Rs. 3,152).

Raisings were 33,770 tons as compared with 41,861 tons in the previous half-year and despatches 31,565 tons as compared with 43,411 tons.

Kunchunpore Tea Co., Ltd.

The directors of the above Company (Managing Agents: Messrs. Duncan Brothers & Co., Ltd., Calcutta) submit the audited accounts of the Company for the year ended 21st December, 1952.

The accounts disclose a loss of Rs. 3,64,320 (Rs. 1,38,549). On transfer of this sum to profit and loss account and after sundry adjustments, including a transfer of Rs. 80,000 (Rs.1,20,000) from revenue reserve and Rs. 89,493 (nil) from buildings and machinery reserve there is a balance at debit of profit and loss account of Rs. 1,76,871 (credit of Rs. 1,169).

The disappointing result is due to an unfavourable market, shortfall in crop caused by early drought and finer plucking during the latter part of the season coupled with the high cost of statutory concessions to labour.

Searsole Coal Co., Ltd.

The directors of the above Company (Managing Agents: Messrs. Gillanders Arbuthnot & Co., Ltd., Calcutta) submit the audited accounts of the Company for the year ended 31st January, 1953.

The result of the year's working, after providing for taxation, is a net profit of Rs. 53,298 (Rs. 35,551) to which has to be added the undisbursed balance brought forward from the last account of Rs. 18,451 (Rs. 17,900) making a total of Rs. 71,749 (Rs.53,451). The directors recommend that the above sum be disposed of in payment of a dividend at the rate of 25 (20) per cent. per annum without any deduction in respect of income tax payable by the Company for the year ended 31st January, 1953 Rs. 31,250 (Rs. 25,000), transfer to development reserve Rs. 20,000 (Rs. 10,000) and leaving to be carried forward the balance of Rs. 20,499 (Rs. 18,451).

SOFT SOAP

Linseed oil	25	lbs.
Groundnut oil	25	"
Rosin	5	"
Caustic potash lye 20°Be	50	"
Caustic soda lye 22°Be	14½	"
Potash carbonate	2½	"

Take the oils and rosin in an iron vessel and heat. When the temperature is about 100°C slowly run in the caustic potash lye with constant stirring. Add water small quantity at a time to make up the loss of water caused by evaporation. When the mass fobs add the caustic soda lye *and continue boiling.* Take care that the oil mixture does not boil over. When the oils and lye are well-amalgamated add the pearlash dissolved in 5 lbs. of water so as to keep the mass thin. When the soap is clear and transparent, it is ready to be poured in suitable container.

DISINFECTING FLUID

Coaltar distillate (of sp. gr. exceeding 1.00)	100	parts.
Rosin	85	"
Caustic soda lye 30°Be	60	"
Vegetable oil	20	"
Water	200	"

Liquefy the resin by the application of gentle heat. Pour in the vegetable oil (castor oil, til oil coconut oil etc.) Now raise the temperature of the mixture to about 100°C and stir in the caustic soda lye. Boil until saponified. Add water from time to time to make up the loss due to evaporation. Then make the soap solution by adding water little at a time until the whole water has been used up. Allow the solution to cool; when cold add the measured amount of creosote oil by continual stirring.

CEMENT FOR FILMS

1932 S. C. H., Salem—Wishes to have a good formula of preparing cement for film.

To cement together celluloid and matograph films prepare the following

Soak 25 ounces isinglass in cold *until it becomes soft, then press* out superfluous water and place it in over heat until it becomes tacky or heavy liquid.

FURNITURE VARNISH

1562 S. K., Mathurai—Wishes to *formulas of furniture varnish.*

I

Orange shellac	4	lbs.
Powdered pale rosin	28	"
Methylated spirit	25	"
Wood naphtha	25	"

Keep the ingredients in a suita vessel and shake occasionally until solved. Then strain through a cloth bottle.

II

Orange Shellac	1½	lbs.
Gum Sandarac	8	oz.
Gum Benzoin	4	"
Methylated spirit	1	gal.

Proceed as above.

AGARBATTI

1605 V. K. M.. Saurashtra—Want good formula of agarbatti.

Musk	10	grain
Ambergris	10	"
Powdered benzoin	1	oz.
" camphor	1	"
" cascarilla	1	dr.
" nitre	1	"
" charcoal	2	oz.

Mix and make an emulsion by add mucilage of gum acacia and dip thin wood splinters into the emulsion.

BOOT POLISH

1657 R. S. S., Delhi—Wants formu of boot polish, turkey red oil and soft so

Beeswax	2½	lbs.
Shellac wax	1½	"
Caustic soda lye 40°Be	8	fl. oz
Turpentine oil	8	pints
Nigrosine, oil soluble	1½	oz.

Shred the waxes and melt th together on a water bath. Add the caus soda lye and stir until saponification

complete and the mass becomes homogeneous. In the meantime dissolve the nigrosine in turpentine oil warmed to 125°F in a separate vessel. Now mix thoroughly when the former is still tepid warm. Continue stirring until the temperature falls down somewhat. The mass should be put into suitable boxes when it reaches honey-like consistency in cooling down. The above is the formula of preparing black polish. For other shades dispense with nigrosine and use sufficient quantity of the following oil soluble colours such as Sudan Brown for brown; waxoline mahogany for dark tan; Bismark brown and Phosphine scales for ox-blood.

TURKEY RED OIL

Turkey red oil or alizarine oil is prepared by acting upon castor oil at about 40°C. with concentrated sulphuric acid. The treatment consists in running into the oil, slowly and with continued stirring, 20 per cent. of 66°Be sulphuric acid, the operation being performed in a lead-lined vessel kept cool by means of ice water. After leaving at rest for two or three hours, the mass is gradually thinned down with water and further diluted by stirring in a thin stream of luke-warm soda solution, about 3 times crystallised soda to each measure of acid used being employed. The finished product settles out on being left over-night.

The product, which is either completely soluble in cold water or readily emulsified is employed in dyeing.

The reactions which take place are complicated, and the sulphonated oil contains a mixture of several substances.

DDT POWDER

1676 I. A. T. C., Ahmedabad—Desires to know recipes of DDT powder and solution.

DDT	10	parts.
Pyrophyllite	90	"

It is reported that milling the DDT with diluents prevents some difficulties. In addition to the above base, a variety of talcs, clays, and soapstone have been used.

AUTO ENAMEL BASE

1713 S. T. R., New Delhi—Wants formula of auto enamel base, auto polish etc.

Drug Nitrocellulose	100	oz.
Rezyl 12	70	"
Blown Castor oil	10	oz.
Dibutyl Phthalate	30	"
Pigment	10	"

AUTO POLISH

Yellow beeswax	1	oz.
Ceresin	2½	"
Carnauba wax	4½	"
Montan wax	1½	"
Naphtha	1	qt.
Turpentine	2	oz.
Pine oil	½	"

Melt the waxes together in a double boiler. Turn off the heat and run in the last three ingredients in a thin stream and stir with a fork. Pour into cans; cover and allow to stand undisturbed over-night.

THINNER

Acetone	80	parts.
Ethyl acetate	20	"
Ethyl lactate	20	"

Mix and being volatile keep in well stoppered bottle.

TOOTH POWDER

1715 J. D. J., Jamnagar—Wants formula of tooth powder and tooth paste.

Precipitated chalk	35	parts.
Magnesium carbonate	25	"
Borax	14½	"
Sodium bicarbonate	14	"
Soap, powdered	4	"
Sugar powdred	7½	"
Methyl salicylate	¾	part.
Menthol	1/10	"
Cinnamon oil	1/5	"

Dissolve the menthol in the methyl salicylate, add the cinnamon oil and then add to borax and mix with sugar. Add to the other ingredients; mix and sift.

TARTAR REMOVING TOOTH PASTE

Precipitated chalk	25	parts.
Neutral white soap	2	"
Magnesium carbonate	8	"
Bentonite	3½	"
Sodium bicarbonate	6	"
Glycerite of starch	28	"
Irish moss infusion (2 % in water)	28	"
Saccharin	½	part.
Flavour	1	"
Liquid paraffin	1	"

Mix in a paste mill and put in collapsible tube.

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

PROSPECTS OF FISH CULTURE IN TANKS

1687 M. C. P., Bongaon --Requests us to discuss the prospect of fish culture along with the procedure to be followed in it.

Fish farming is an important industry of East India (Bengal), Southern (Madras) and Western India (Bombay) has a double importance in it not only being a source of livelihood of millions of fishermen but also a means of subsistence of the people of these places. These areas specially Bengal are purely rice eaters. Rice lacks in nutrients which will be balanced by protein in fish. Thus fish is essential to supplement the diet of Bengalees who are mostly rice eaters. This business is very lucrative.

Tanks are divided in two classes for fish culture viz: tanks suitable for fish culture and tanks unsuitable for fish culture. By proper adjustment and care barren tanks can be made to produce fish. Newly dug and cleared tanks do not contain fish food so fish in these tanks do not increase in weight. But by supplying cowdung, excretion of domestic birds and beasts, and cakes, green grass and other organic food such as ammonium superphosphates, etc. these tanks may be made to productive for fish culture.

Old and uncleared tanks having too much vegetation and muddy clay in the bottom is not suitable for fish culture. These tanks can be made productive by first clearing then supplying fish food mentioned above.

Tanks containing proportional quantity of vegetation and fish are suitable for fish culture. But these also require adequate supply of fish food from time to time.

Tanks having steep and deep side walls abound in fish, tortoise and even snakes which are enemies of rohi, katla, mrigal and other varieties of fish. In order to make productive these tanks should be free from fish enemies by drying them from time to time.

Of the productive tanks shallow annual tanks are suitable for fish culture. Water remains in these tanks for 9 or 10 months in a year. The sun's rays reach to the bottom of shallow tanks and thereby freed them from poisonous gas which is detrimental for the growth of fish. Fish grow very rapidly in these tanks.

According to Dr. Hora sloping tank 500 ft. long and 1 ft. to 10 ft. deep are ideal for fish culture.

Tanks with big trees on South and West sides is conducive to the growth of fish.

After selecting the tanks attention should be paid to selection of the type of fish suitable to a locality. Only healthy, reliable and proper seed should be introduced. The type raised should be quick growing. It is always better to find out the possibilities of raising the local fishes. Any local fish that grows 2 lbs. in weight in a year is economic to grow. Then there is no need to bring seed from outside. Attempts should at the same time be made to preserve the breeding fish. It is uneconomic to kill them, as a "Rohi" fish gives returns equal to that of a cow. Spawns of "Rohi" fish are very costly and a "Kanaka" of it weighing about a seer fetches handsome prices.

For success of fish farming enthusiasm, willingness to work with one's own hands and the full knowledge and understanding of the fish farming are absolutely essential.

To make the enterprise successful all necessary improved implement to carry out various operations are very essential. Like agriculture these implements are of foremost importance. To start with a "Harra" should be purchased. Without provision of proper nets, it is not possible to manage the farm. A few kinds of nets detailed below should be purchased. Net for collecting spawn it is of very fine mesh and is made of fine thread, "Chat-jal" is of ⅛ inch mesh, "Ghantasarang" is of ¼ inch mesh, "Sarang"

(Continued on page 61)

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of Re. 1 stamps for each question. Subscribers outside India are requested to send eight International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

1 F. L., Jullundur City—Formulas of roof paint will appear in due course.

2 M. J., Chingavanam—Process of manufacturing syrup will be found in Manufacture of Syrups and Cold Drinks published from this office, price Rs. 3/12/- including postage.

5 M. L. S., Karnal—For vacuum pump and ball mills enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place and Volkart Bros, 8, Netaji Subhas Road; both of Calcutta.

6 D. C., Bhadravati—Vermicelli making machineries may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. Labels may be had of Sikri & Co., 55, Canning Street, Calcutta. Formulas of vinegar, tomato sauce, marking ink, etc. will appear in due course.

7 D. M. D., Tezpur There is no institution where training is given on insurance. You may read some book on insurance.

9 A. D. I. C., Bharatpur—Process of manufacturing table salt will appear in due course.

14 P. C. J., Khatauli—For superphosphate enquire of Acme Fertiliser Works, "C" Block, Hide Sheds, Kidderpore Docks, Calcutta; Atlas Fertilisers Ltd., 4, Bankshall Street, Calcutta and Dawn & Company, 11, Portuguese Church Street, Calcutta.

15 S. N., No address—For sounder in telegraph instrument enquire of the following firms: Chicago Telephone & Radio Co. Ltd., 127, Mahatma Gandhi Road, Fort, Bombay; Ericson Telephone Sales Corporation Ltd., P. O. Box 2324, 166, Lower Circular Road, Calcutta and Standard Telephones & Cables Ltd., Wellesley House, 7, Wellesley Place, Calcutta.

16 L. A. W. W., Coimbatore—Following is a list of aerated water requisite dealers: T. S. Abdullabhoy & Co., 290-92, Abdul Rehman Street, Bombay-3; Essence & Bottle Supply Co., 14, Radha Bazar Street, Calcutta; Akbarally Mahomedally & Co., 316, Abdul Rehman Street, Bombay; Parry & Co. Ltd., "Dare House," Post Box 12, Madras and Calcutta Essence & Glass Supply Co., 2, Ezra Street, Calcutta.

17 R. L. A., Raipur—Following is a list of advertisement agents: Publicity Society of India Ltd, 1, Waterloo Street, Calcutta; Metro's Publicity, Sales & Service Ltd., 10, Clive Row, Calcutta; D. J. Keymer & Co. Ltd., 5, Council House Street, Calcutta; J. Walter Thompson Co. (Eastern) Ltd, Lakshmi Bldg., Sir P. Mehta Road, Bombay and L. A. Stronach & Co. (India) Ltd., Wavell House, Graham Road, Ballard Estate, Bombay.

19 S. M., Calcutta—For saw making machines enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta and Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

21 M. B. S., Kharsia It is very difficult to suggest names of purchasers of raw hides. You better advertise in Industry. We have no book on hide but we have one book on Leather and Leather Goods, price Re. 1/10/- including postage. Following is a list of leather institutes in India: Bengal Tanning Institute, Canal South Road, Pagladanga, Calcutta; Government Leather Working School, Kanpur; Government Leather Working School, Meerut; and Government Tanning School, Fatehpur.

22 S. S., Neemuch—Following is a list of loan offices: Bombay Provincial Co-operative Land Mortgage Bank Ltd., 9, Bank House Lane, Bombay; Canara Industrial & Banking Syndicate Ltd., Homji Street, Bombay; British India Banking Corporation Ltd., 150, Rash Behari Avenue, Calcutta and Simla Banking & Industrial Co. Ltd., 88, Queensway, New Delhi.

24 B. L., Bombay—Following is a list of tailors and outfitters: Broadway Tailors, Raj Mahal, Church Gate Street, Bombay; Evans Fraser & Co., Hornby Road, Bombay; M. Charag & Co., Sandhurst Road, Bombay; Chowringhee Tailoring Co., 16/3, Chowringhee Road, Calcutta and Francis Morrison & Co., 48, Dharamtala Street, Calcutta. Following is a list of slate and slate pencil manufacturers: Enamel Steel Slate Factory, Gali Beri Wali,

Patram Street, Delhi; Leela Slate Works, *Markapur, Kurnool; Markapur Slate Works, Markapur, Kurnool; Megha Slate Factory, Baramati and Sree Narmada Slate Works, Markapur, Kurnool.*

25 M. K. P., *Chendamangalam*—Confectionery machines and other equipments may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

29 F. L., Jullundur City—We have no book on roofing felt manufacture.

31 O. P. S., Delhi—Ultramarine blue may be had of Lakshmi Paint Works, 14/2, Old China Bazar Street, Calcutta. Process of manufacturing ultramarine blue will appear in due course.

35 B. B. K. M., Bobbili—Sugar is manufactured out of jaggery with the help of centrifugal machine. Centrifugal machines may be had of Standard Machinery Co., 67B, Netaji Subhas Road, Calcutta and Mousell & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta.

36 M. A. R., Jamshedpur—For knitting machines and knitting machine needles enquire of Dawn & Co., 11, Portuguese Church Street, Calcutta; Knitting Machines Syndicate, 25-26, Waterloo Street, Calcutta and Hindusthan Machinery Works, Kothi Megh Singh, Ludhiana. Three winding machines may be had of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta. For paper tubes enquire of Gogate Paper Box, Princess Street, Bombay.

39 R. C. W., Hoshiarpur—Empty drums may be had of Bengal Hardware & Tin Seal Mfg. Co., 70, Netaji Subhas Road, Calcutta; Eastern Drums & Bucket Factory, Bengali House, 5th Kamatipura, Bombay and Imperial Drums Factory, Old Boyco Flour Mills, Grand Road, Corners, Bombay.

43 T. A., Cuddahpah—Vegetable tallow may be had of Blue Bird Stores, 3, Bertram Street, Calcutta; Goodwill & Co., 34-35, Bertram Street, Calcutta and Mazdas Ltd., 7-1, Lindsay Street, Calcutta. Palm oil and lavender oil may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

47 S. P. W., Vizianagram—It is not possible to manufacture eau-de-cologne without alcohol. Lavender oil should be dissolved in alcohol and this should be further diluted by adding sufficient quantity of water.

49 D. R. G., Lucknow—As far as we know the thermosflask is not manufactured in India at present.

50 C. R. W., Delhi—Wants to be put in touch with the suppliers of metalic fittings for hot water bottles (rubber) and ice bags (rubber).

51 K. S. S. R., Rajnandgaon—Wants to be introduced to National Winder (India) manufacturers of "Cinni Universal" fans.

53 T. B. L., Rajkot—Following is a formula of agarbatti: Musk 10 grains; ambergris 10 grains; powdered benzoin 1 oz.; powdered camphor 1 oz.; powdered cascarilla 1 dr.; powdered nitre 1 dr.; powdered charcoal 2 oz. Mix and make in a thin paste with mucilage of tragacanth when sticks are made by dipping thin wooden splinters into the emulsion.

56 A. S. R. S., Palakol—For platinum enquire of Hamilton & Co. Ltd., 8, Old Court House Street, Calcutta.

59 H. R. S., Kapurthala—Scents and perfumes may be had of Paradise Perfumery House, 7, Colootola Street, Calcutta and F. N. Sircar, 37, Canning Street, Calcutta. Oil refining plant may be had of Subol Dutt & Sons Ltd., 13, Brabourne Road, Calcutta.

60 R. B. S. M., Poona—For starch making plant enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta and Volkart Bros., 8, Clive Street, Calcutta.

62 T. S., Nandyal—Colourless masses which may be cut and polished to resemble diamonds are obtained by condensing urea (1 mol.) and formaldehyde (2.0-2.5 mol.) in presence of activated silica gel or sodium silicate e.g., by boiling for about 35 min. filtering and concentrating.

65 S. M. S. D., Delhi—For safety pin and paper clip making machines write to Baird Machinery Co., Bridgeport, Connectient, U. S. A. There is no such institution where practical training is given on the manufacture of above articles.

67 S. M. P., Shimoga—To prepare perfumed betelnuts pulverise the betelnuts and then mix with a small quantity of glycerine. Next put some harmless pink colour like ammoniated carmine solution and finally perfume with menthol, eucalyptus oil, camphor, etc. the proportion of which may be ascertained by a couple of trials.

68 M. L. R., Ranchi—Glasswares may be had of A. M. Dadabhoy, 55, Canning Street; Ananta Kumar Ghosh & Co., 9, Ezra Street; Bepin Behari Paul, 9, Old China Bazar Street; Biswanath Dutt & Co., 203, Old China Bazar Street; Bombay Co. Ltd., "Pollock House," Pollock Street; Imperial Glass Works, 9, Ezra Street and S. Jamal Ahmed & Co., 192, Old China Bazar Street; all of Calcutta. Porcelain wares may be had of Bepin Behari Paul, 195, Old China Bazar; Dutt & Co., 28/2, Old China Bazar Street and Radha Kanto Dass & Sons, Ltd., 211, Old China Bazar Street; all of Calcutta.

70 N. M., Surat—We do not purchase old issues of "Industry." Melt the boot polish over water bath and add requisite quantity of turpentine oil. For embossing machines enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta. For sandal wood articles enquire of Mysore Supplies, Post Box No. 6, Mysore; Alekal Shivanand Rao & Co., Sorab, Shimoga, Mysore and Mysore Art & Wood Works, Bangalore City.

71 J. M. P. S., Parlakimedi—Eucalyptus oil may be had of Aronda Chemical Works, Bombay-4; Coonoor Eucalyptus Oil Distillery, Coonoor; Crescent Eucalyptus Oil Refining, Mettupalayam, Trichinopoly; K. S. M. A. & Pure Eucalyptus Oil Distillery, Upper Bazar, Coonoor and Kotagiri (Nilgiris) Eucalyptus Oil Distilleries, Fern Hill, Nilgiris. Plastic goods may be had of Indian Plastics & Moulding Co., 9, Bechulal Road, Calcutta; Plastics Moulders Ltd., 71, Canning Street, Calcutta and Plastico Iron (India) Ltd., 157, Jessore Road, Dum Dum South. Cardboard boxes may be had of S. Antool & Co. Ltd., 91, Upper Circular Road, Calcutta and Bengal Cardboard Industries & Printers Ltd., 22/1, Gorachand Road, Calcutta-14.

72 R. V. B. F., Nannilam—Wants to be introduced to Midha and news bale importers at Madras and Bombay.

73 D. G. P., Kisumu—It is not possible to remelt the snow which has hardened. You may however boil over water bath and add some warm water and stir thoroughly for some time when the whole will be a homogeneous mass.

74 P. M. W., Khekra—Collapsible tubes may be had of Metal Box Co. of India Ltd., 41, Chowringhee, Calcutta and Pioneer Metal Industries, 103/1B, Raja Dinendra Street, Calcutta.

75 S. K. B., Bargarh—Sodium silicate, powdered glass, black lead etc. may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

76 M. S., Secunderabad—Sporting goods may be had of S. Chowdhury & Co. Ltd., 90, Harrison Road; Sarkar & Co., 76, Harrison Road; Mohuntosh Bros. Ltd., 15, College Square and Pioneer Sports Ltd., 25, Chowringhee Road; all of Calcutta.

77 V. R., Vizagapatnam—For glass sheet of required size enquire of Bombay Mirror Mart, 126-1, Canning Street; Deb K. Raw Co., 7, Swallow Lane; Fotic Lal Seal & Sons, 10, Swallow Lane; all of Calcutta.

81 P. S., Hoshiarpur—Rings with pictures inside come from France. For addresses you may negotiate with the Consulate General for France, Flat 26, Park Mansions, Calcutta.

83 G. D. S., Bijnor—For selling the old lathe and buying a new one you should advertise in newspapers. You may also negotiate with Alfred Herbert (India) Ltd., 13/3, Strand Road; Francis Klein & Co. Ltd., 1, Royal Exchange Place and Marshall Sons & Co. Ltd., 99, Clive Street; all of Calcutta.

87 D. D. G., Bhatinda—Defect of the caustic soda is due to oxidation.

88 S. R. M., Kumbakonam—Process of manufacturing pin wheels will appear in due course. Address of W. J. Bush & Co. Ltd., is 28, Ash Grove, Hackney, London, E-8.

89 N. S. B., Nagpur—To prepare camphor cakes or tablets moisten the camphor crystals with alcohol by spraying; then put in moulds and compress. By this means the camphor will volatilise leaving aside camphor in the form of blocks. Process of gilding glass bangles appear elsewhere in this issue.

91 S. P. D., Patiala—For plastic engraving machine, plastic sheets and other ingredients enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta. Add water to sugar to dissolve.

(Continued from page 58)

French and Portuguese Possession in India is of ½ inch mesh, "Gujril" is of 3 inches mesh, "Barjal" is of 1½ to 2½ inches mesh and one even of bigger mesh for harvesting bigger fish. Fish farming even under ordinary conditions is a paying proposition. At a low and moderate estimate an acre of fish farm can easily give a profit of about Rs. 100/- to Rs. 200/- per year. Pisciculture has been and still is in the hands of the illiterate fishermen. Very little scientific research work has been done to explore its possibilities as an important source of national wealth. According to Dr. Hora if a fish farmer paid as much attention to his pond as an agriculturist does to his land, pisciculture would be much more paying than agriculture.

Trade Enquiries

(To communicate with any party write to him direct with name and address given below mentioning Industry.)

116 Midland Carnival Co., Camp Alut Gama, Alut Gama, Ceylon—Want to be put in touch with the owners of Merry-Go-Round.

Export and Import Regulations

EXPORT OF MINERAL KHAKI CLOTH AND APPAREL MADE THEREOF

The following Notice (No. G-118/53, dated the 22nd May 1953) has been issued by the Joint Controller of Imports and Exports, Calcutta :—

As a sequel to the extension of free licensing of cloth upto the end of September 1953, and in continuation of our Notice No. G-28/53, dated the 2nd February 1953 *, it has been decided to allow exports of Mineral Khaki Cloth and Apparel made thereof during the period July-September 1953, as follows :—

(a)	Mineral khaki drill	25 per cent of production of the mill concerned during the period July-September 1953.
(b)	Mineral khaki cellular shirting.	15 per cent of production of the mill concerned during the period July-September 1953.
(c)	Other types of mineral khaki fabrics.	Ditto.
(d)	Apparel made of mineral khaki cloth.	7½ per cent of the quantity of coarse and medium apparel other than mineral khaki or olive green apparel exported by each exporter since the introduction of the free licensing scheme.

2. In the case of (a), (b) and (c) above, licences will be issued only to the mills manufacturing the particular varieties or to their nominees. Such of those manufacturers who produce these items and desire to export their goods should apply to this office for allotment letters in the following manner : -

(*i*) The first allotment to the mills will be made on the basis of their actual production of the items concerned during the period, 1st July 1953 to 31st July 1953. Applications for allotments should be made to the nearest Export Trade Control supported by a certificate from a Registered Accountant certifying the production of the item concerned during this period. Such applications should be made before the 15th August 1953. No treasury chalan is required for issue of allotment letters. Allotments will be issued to the mills-straight-away for the quantities as indicated above.

(*ii*) The second and third allotments will be based on (1) the actual production of the items concerned during the month of August 1953 and (2) the anticipiated production during the month of September 1953, calculated on the basis of August production.

3. Applications for allotments based on the production of the items concerned during each month should be made at the end of the respective month to the nearest Trade Control Authority. Each application should be accompanied by a certificate from a Registered Accountant about the production during the period referred to. Allotment will be issued on the basis of percentage indicated above.

4. Allotments made to the mills will authorise them to take out licences either in their own name or in favour of their nominees.

5. Applications for export should be made as usual on the prescribed form—supported by a treasury chalan and quoting Income-tax Verification Certificate Registration or Exemption Number. Where cloth is to be exported by a nominee of the mills, the original letter of nomination given by the mills concerned, should also be produced by the nominees.

6. Export against licences issued under this procedure will be allowed to any permissible destinations excluding Nepal, French and Portuguese Possessions in India and the licences thus issued will be valid for shipment till the end of September 1953.

7. (a) Exporters desirous of exporting apparel made of mineral khaki cloth will be allowed to export this variety of apparel upto 7½ per cent of the quantity of coarse and medium apparel, other than mineral khaki and olive green apparel, exported by them since the introduction of the free licensing scheme.

Tender Notices

SUPPLY OF ENGINE

The Director General of Supplies and Disposals, Shahjahan Road, New Delhi, invites Tender No. SE2/17861C/II to reach his office on or before the 28th July 1953 on forms (not transferable) per set to be paid in cash, by Money Order or Indian Postal Order (quoting tender number, full name and address of the remitter) for 1 No. of Single Cylinder, Horizontal, Cold Starting Oil Engine 17 B. H. P.

Applicants, who are not on the approved list of this Directorate General, must give their Banker's reference on applications for tender forms. Firms, already blacklisted by this Directorate General are not eligible for copies of tender form which will not be supplied to them. Tender forms are available from the office of the Director General of Supplies and Disposals, New Delhi, and also from the Director of Supplies, Calcutta and Bombay and the Deputy Director of Supplies, Madras, on payment of tender fee of Rs. 4.

SUPPLY OF BOILERS

The Director General of Supplies and Disposals, Shahjahan Road, New Delhi, invites Tender No. SE-2/17861-C/II to reach his office on or before the 28th July 1953 on forms (not transferable) obtainable from his office at Rs. 12-8-0 (not refundable) per set to be paid in cash, by Money Order or Indian Postal Order (quoting tender number, full name and address of the remitter) for—

(1) 2 Nos. Horizontal Water Tube Boiler.

(2) 4 Nos. Cochran Vertical Multitubular Boiler.

(3) 2 Nos. Hopewood Vertical Multitubular Boiler 7′-0″ high × 3′-⅜″ dia.

Applicants, who are not on the approved list of this Directorate General, must give their Banker's reference on applications for tender forms. Firms, already blacklisted by this Directorate General are not eligible for copies of tender form which will not be supplied to them. Tender forms are available from the office of the Director General of Supplies and Disposals, New Delhi and also from the Director of Supplies, Calcutta, Bombay and the Deputy Director of Supplies, Madras, on payment of tender fee of Rs. 12-8-0.

SUPPLY OF TURBO ALTERNATORS, ETC.: EXTENSION OF TENDER DATE.

The Director General of Supplies and Disposals, Shahjahan Road, New Delhi, notifies that Tender No. SE2/19222-D/IV for the supply of 2 Nos. 1000/1250 K. W., 3,300 volts, 3 phase, 50 cycles, Turbo Alternators with 3 Nos. Boiler Water Tube, required for the Western Railway, Ajmer, which is due for opening on the 20th June 1953, will now be opened at 11-30 a.m. on the 31st July 1953, and shall remain open for acceptance till the 31st October 1953. All tenders should reach the office of the Director General of Supplies and Disposals, New Delhi, at 10 a.m. on or before the 31st July 1953.

SUPPLY OF MAN WEIGHING MACHINES

The Director General of Supplies and Disposals invites Tender No. P/SW3/25263-D/III to reach him on the 15th July 1953 at 10 a.m. on tender forms (not transferable) obtainable from his office at Shahjahan Road, New Delhi, at Rs. 3 (not refundable) to be paid in cash, by Money Order or Indian Postal Order (quoting tender number, full name and address of the remitter), for 500 Nos. of Machine Weighing, Man, Capacity—24 Stones.

Consignee.—The Commandant, C O. D., Kanpur.

Applicants, not already on the approved list of Supplies and Disposals Directorate, must give their Banker's reference on applications for tender forms. Firms, already blacklisted by the Supplies and Disposals Directorate, are not eligible for copies of tender forms which will not be supplied to them.

INDUSTRIAL PRODUCTION

Industries		1951	1952	December, 1952	January, 1953*	Feb., 1953*	Feb., 1952
Major Industries.							
Coal	lakh tons	343.08	362.22	32.26	31.10	30.61	32.18
Steel	lakh tons	14.99	15.78	1.41	1.46	1.26	1.25
Yarn	million lbs.	1,304.10	1,448.30	135.0	131.0	116.0	110.9
Cloth	million yds.	4,076.40	4,603.20	426.0	419.0	381.0	340.6
Cement	lakh tons	31.96	35.37	3.19	2.94	2.73	2.47
Paper	tons	1,31,916	1,37,504	11,946	11,651	11,235	10,818
Matches	cases	5,77,200	6,08,200	54,200	53,300	51,100	48,400
Sugar	lakh tons	11.15	14.19	2.08	3.08	2.92	3.06
Engineering and Electric Industries.							
Machine tools	value in lakhs of Rs.	47.30	44.37	3.02	2.99	2.93	3.64
Electric lamps	lakhs	155.16	208.81	19.71	18.74	17.61	17.08
Dry cells	crore Nos.	14.34	13.02	1.24	1.09	1.19	1.44
Transformers	k.v.a.	1,94,400	2,14,800	25,100	23,000	24,100	16,100
Motors	h.p.	1,42,000	1,57,600	14,300	14,500	13,800	13,000
Electric fans	Nos.	2,12,400	1,95,500	15,100	14,200	13,000	17,000
Radio receivers	Nos.	68,100	71,495	5,064	4,349	4,926	4,264
Storage battery	Nos.	2,10,000	1,58,400	7,700	9,500	9,500	17,600
Cables and wires—							
Copper conductors	tons	3,000	5,928	793	484	771	189
Winding wires	tons	300	398	34	33	44	41
Rubber insulated cables and flexibles	lakh yds.	411.60	328.6	32.2	32.3	34.1	30.1
Insulators—							
H. T.	Nos.	2,44,800	3,25,000	35,700	23,600	42,100	37,100
L. T.	lakh Nos.	14.32	30.50	2.48	3.09	2.21	2.32
Chemical Industries.							
Salt	lakh mds.	743.75	768.64	31.04	30.50	40.26	43.48
Caustic soda	tons	14,724	17,058	1,581	1,450	1,624	1,311
Soda ash	tons	47,532	44,322	4,601	4,989	3,700	3,839
Chlorine liquid	tons	5,268	6,240	669	604	630	467
Bleaching powder	tons	3,588	792	73	76	73	85
Bichromates	tons	3,276	1,463	157	182	174	173
Sulphuric acid	tons	1,06,932	96,081	9,340	8,596	8,600	5,973
Superphosphates	tons	61,020	46,650	2,245	866	1,730	4,246
Miscellaneous (Minor) Industries.							
Sewing machines	Nos.	44,160	50,045	5,216	4,947	4,740	4,425
Hurricane lanterns	lakh Nos.	39.76	35.23	3.29	2.97	2.87	3.17
Bicycles	Nos.	1,14,276	1,96,956	25,341	10,472	16,929	10,797
Cycle tyres and tubes	lakh Nos.	88.38	83.55	7.25	7.19	8.78	7.77
Motor tyres and tubes	lakh Nos.	16.91	13.83	0.97	0.89	1.10	1.45
Cigarettes	crore Nos.	2,194.68	2,058.85	174.45	185.16	150.71	190.72
Plywood—							
Tea chests	lakh sq. ft.	606.48	782.27	57.35	42.05	60.00	77.73
Commercial	lakh sq. ft.	112.00	122.58	14.99	15.32	15.00	9.64
Refractories	lakh tons	2.37	2.43	0.20	0.20	0.20	0.20
Abrasives	reams	37,200	55,000	5,000	4,800	5,500	4,400
Sheet glass	lakh sq. ft.	110.89	90.42	18.86	25.32	15.75	13.69
Woollen manufactures	lakh lbs.	177.00	166.68	16.61	14.84	12.38	11.04
Footwear—							
Western type	lakh pairs	36.40	33.67	2.74	2.48	2.75	3.19
Indigenous type	lakh pairs	20.73	18.06	1.48	1.68	1.74	1.75
Alcohol—							
Industrial	lakh galls.	68.46	68.45	6.57	4.88	3.25	6.34
Power	lakh galls.	58.09	77.42	6.26	7.29	6.91	8.26

Figures are subject to revision month to month. * Provisional.

Industry

MONTHLY MAGAZINE

WEST BENGAL SECRETARIAT
HOME DEPARTMENT

CALCUTTA, THE 30th Jany 195 3

D.O. No.

This is to certify that I had known the work of Signograph Co. in connection with manufacture of transfers from the time that I had been on the East Indian Railway as General Manager. They are a pioneer company in this line and have uniformly done good work and when I took over charge as Director General, Transportation, Government of West Bengal, I found lot of money was being wasted over painting of special signs for the Transport Buses. I requisitioned the services of this company for manufacture of transfers for the State Transport Organisation, Govt. of West Bengal, and they have kept up their reputation and done very satisfactory work in the manufacture of the signs for the State Transport. I wish the company every success.

Secretary & Director General,
Transportation, Govt. of West Bengal.

BARNAGORE, CALCUTTA - 36.
Phone : B. B. 4870

—CLASSIFIED BARGAINS

ADVERTISEMENTS under this head of small announcements cost 4 As. per word, minimum Rs. 2 payable by Postage Stamp or M.O. with order. No vouchers given.

To Readers—In writing to advertisers the Readers are requested to write legibly and quote that they are writing in response to advertisement in INDUSTRY. This would ensure prompt attention. Letters to Advt. No. should be duly stamped.

LIST OF CLASSIFICATIONS.

Agents Wanted
Agencies Wanted
Agencies, Foreign
Analytical Works
Bank & Insurance
Battery
Bills, Bonds, Hundies
Book Binding Materials
Books & Periodicals
Bottles & Corks
Brass Component
Brushes
Button & Ivory
Carbon Brushes
Cardboard Boxes
Chemicals & Minerals
Cinema Distributors
Crude Drugs
Cycles & Cars
Cutlery
Dental & Optical Materials
Educational & Instructions
Expert Wanted
Filter Paper
Financial
Floors & Floor Covering
Foods & Provisions
Fire Clay
Fire Bricks
Gardening Agriculture
House and Land
Importers & Exporters
Jewelleries
Lables
Machinery & Hardware
Medicines
Miscellaneous Advtg.
Optical Goods
Paint & Colours
Patents & Trade Marks
Perfumery Materials
Perfumery & Toilets
Personal & Professional
Plywood & Bobbin
Photography
Potteries
Publicity
Printing & Stationery
Radio & Electric Goods
Rubber Goods
Rubber Stamps
Sale & Purchase
Scientific Apparatus
Situation Wanted
Situation Vacant
Small Tools
Sports, Music & Arts
Springs
Stamps & Coins
Stocks & Share
Soap Material
Soap & Perfumery
Surgical Instruments
Soda Water Machines
Talkie Machineries
Tea & Confections
Textile Materials
Tin Boxes
Toys
Tobacco
Wearing Apparels

AGENTS WANTED

"Bengal Leather Industries, 10/C, St. James Square, Calcutta. Wanted Stockist-agents for Indian & export quality hand-designed ladies bags, dollar cases, moneybags, camel leaeher goods etc." (24-18 AA)

D. D. Malam—A Soothing Ointment for all Skin Diseases, never stains on clothes. Wanted Agents, Mahatma & Co., Jorasanko, Calcutta 7. (16-306 AA)

Wanted Agents to Earn 500/- Monthly working for Embossers, Nameplates & Locks. Apply International Industries Ltd., Telephone No. 144 Aligarh. (14-39 AA)

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CONTENTS FOR MAY, 1953.

Contents for JUNE ISSUE.

June issue of Industry will contain useful articles on industrial and technical subjects such as Manufacture of Ice Cream; Corrosion of Tin; Television Outside the Entertainment Field in addition to the regular features such as Agricultural Tips; Scientific Researches and Inventions; Engineering Notes; The Business World; Official India; Pharmaceutical Recipes; Formulas Processes and Answers; Reader's Business Problems and Queries and Replies.

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INDIAN INDUSTRIES AND GOVERNMENT

The Federation of Indian Chambers of Commerce and Industry has recently told the Stores Purchase Committee of the Government of India that a careful approach should be made to the question of giving a fillip to the establishment of new industries by meeting as large a demand of Government purchases as possible from indigenous sources. The demand has been voiced not a day too early and is quite in consonance with the country-wide desire to place our industrial economy on an even keel. The Five-year Plan's attitude to industrial development is, to say the least, unhelpful and step-motherly. As a corrective to this defect, the Government can and ought to encourage the consumption of indigenous manufactures, wherever possible, in preference to their foreign made substitutes. This will bring about economy in the spending of foreign exchange and also promote the growth and development of the country's industries which, for more reasons than one, have fallen on evil days.

The Federation has suggested further that Screening Committees should study the possibility of indigenous manufactures which are being imported at present ; that trial orders on indigenous manufacturers, in consultation with the Development Wing of the Ministry of Commerce and Industry, should be extended so as to examine more thoroughly the possibilities of manufacturing items which are imported at present ; and that the likely requirements for the next four or five years should be given wherever possible. The Federation wants the different purchase organizations to co-ordinate their activities with a view to placing orders with the Indian Supply Mission, Washington, and ISD, London, only when the stores cannot be had from local suppliers. Showrooms need to be established, where all types of stores required, including those now being imported, should be displayed.

The way, in which the Indian trade and commerce have been stressing the need for consuming indigenous manufactures for some time past, is likely to create the impression that the Central as well as the State Governments have not yet thought it proper to dispense with the use of foreign products and to patronise their country-made substitutes. We cannot but take with a large dose of salt the erroneous contention that those who had been crying themselves hoarse over the need to boycott foreign products, have undergone a strange metamorphosis immediately on assumption of power. The principal reason why the Government have not yet succeeded in depending exclusively on indigenous products, may well be that not all the goods they have to consume are yet manufactured within the country. Nevertheless, they will have to cut down the use of those foreign products whose substitutes our industries can and do put out.

That the Government is seriously considering the matter of ending their dependence on foreign manufactures and replacing their consumption by that of their indigenous counterparts, is amply borne out by the fact, that Stores Purchase Committee, set up by the Government, is now busy investigating the possibility. In fact, the Federation made the suggestion under review in reply to a questionnaire issued by the Stores Purchase Committee. It is common knowledge that most countries of the world have found in their Governments the principal patrons of their industries and there is no reason why this country's Government too should not follow suit.

The above contention, however, is not altogether flawless. It is not without reason why the Government has not yet succeeded to any sufficient extent in replacing its use of foreign products by that of indigenous manufactures. Also, there is not much strength in the argument that officialdom's attitude is one of partiality in so far as foreign products are concerned, and of aversion as far the indigenous manufactures are concerned. The most formidable deterrent to a wholesale consumption of Swadeshi goods by the Government so far as their unsuitability in point of quality. Officialdom has been heard to complain from time to time that this country's manufacturers seldom pay enough attention to either quality of their goods or to a scrupulous subscription to the need for making them according to the specifications of samples supplied by the

Government. They also often fail to deliver their wares within the time limits laid down in the order. In consequence, the Government has had to suffer losses on several occasions when sought to encourage indigenous industries by patronising their products. Our overseas customers too are not very satisfied with the quality of our products, leave alone the complaint against their high prices which cannot but compare unfavourably with the prices of their foreign counterparts. There is thus the need for our manufacturers to go about at once into the most urgent task of improving the quality of their products and of reducing their cost of production to be able to quote competitive rates for their wares. The good old days of the Swadeshi movement when indigenous manufactures received countrywide support and patronage more or less on sentimental grounds, are no more. Our countrymen have abandoned their older predilection for Swadeshi goods: their post-transfer-of-power experiences have dealt a rude shock upon their previous sentiments, due to which they have learned to associate the Swadeshi spirit with national capitalism. They no longer consume Swadeshi goods as blindly and with as much pride as they used to, a decade or so ago. They are gradually opening their eyes to such things as quality and price. What applies to the people docs so equally forcefully to the Government too.

The attitude of Big Money towards the country's numerous cottage and other small and medium-sized industries is one of keen rivalry on account of the very substantial official attention now being paid to the latter's development. This feeling of rivalry is manifest quite perceptibly in the field of cloth production. In this connexion one has only to recall the battle of words into which the Madras Premier and small industries on the one hand and the Bombay-Ahmedabad textile magnates on the other had flung themselves a short while ago. We are, therefore, very glad to find that in their reply to the Stores Purchase Committee's questionnaire, the Federation of Indian Chambers of Commerce and Industry have not failed to speak a word or two in favour of the small and medium-sized industries. Its support for them, however, is qualified as well as limited. As the Federation holds, a comprehensive list of products that can be purchased by the Government from cottage and smallscale industries should be drawn up and every attempt should be made to develop them. The Federation has even gone to the length of welcoming the increasing attention now being paid to the development of these industries. But at the same time it takes the view that it will not be practicable to reserve any particular field of stores for supply only through cottage. and small-scale industries. As we know, the competition between the products of our cottage industries and those of the largescale ones is very unequal. Also, in point of quality and prices the latter enjoy certain definite advantages over the former. Therefore, if the small industries are left to fend for themselves, the Government according no preferential treatment to them, it may well be that the big industries will swallow them up or relegate them to a very insignificant and minor sector of our national economy. We are sure that without an appreciable development of our largescale industries the Indian masses will not be able to work out their economic salvation. Even so, the role of small industries is quite important in our economy. On them depend millions of our poor commonfolk for their living and they provide occupation to our peasants and cultivators during the off-seasons. Aiming as it does to serve the greatest good of the greatest number, the Government seems to have taken the correct step in deciding to promote the growth and development of the cottage industries.

UNEMPLOYMENT PROBLEM

Unemployment is rising by leaps and bounds and nowhere else is the problem so acute as in West Bengal and Madras, the two States which together can claim to their credit or discredit a very large number of educated young people. Up till now the Government seem to have looked upon this sickening phenomenon of unemployment and the resulting discontent in a rather do-nothing complacent manner. In the above context, the news will be welcomed by many that the planning Commission has decided to make a number of changes in the Five-Year Plan to meet the growing threat of unemployment. It is reported that expansion is likely in three directions: Medium-sized irrigation projects, small-scale industries and other acceptable items as may be suggested by the States. The following extract from a newspaper report gives more details of the adjustments the Planning Commission has in view:—

"Whenever suggestions are invited for local schemes in areas prone to famine conditions, only palliatives are generally proposed. The Planning Commission has now asked for proposals of more permanent utility, such as building of weirs and large tanks so that even, if rains fail for a number of years, no hardship may result.

"Small-scale industries will be promoted by advancing loans in deserving cases. Provision for such loans already exists in most States. The Centre would now be willing to augment State resources.

"Thirdly, the Government of India is studying the nature of unemployment wherever it exists, particularly among city dwellers. No general prescription applicable to all regions can be evolved. In the States of West Bengal, Madras and Travancore-Cochin the problem is known to be particularly pronounced.

"In West Bengal it has been accentuated by the influx of refugees; in Madras by the power cut; and in Travancore-Cochin by certain local causes. Local remedies will have to be devised in each case."

N. E. FRONTIER

Assam's tribal regions now being administered by the Government of India are pulsating with a new life on account of the various development schemes which are being implemented with some speed and seriousness the task well deserves. The 3-Crore development scheme prepared by the Planning Commission for the 5-year period beginning 1951-52, includes the development of agriculture, veterinary services, sericulture, forests, roads, education and public health, the funds allotted being as follows:—

	Rs.
Roads	1,35,00,000
Medical and public health	65,00,000
Agriculture	32,00,000
Education Cottage industries	48,00,000
Forests	20,00,000

Assam's tribal regions are hilly and communication there are very difficult. The allotment of 46 p.c. of the total development expenditure on the development of communications, therefore, seems well-justified. Altogether, 1637 miles of road will be laid, out of which 371 miles have now been completed.

In regard to public health and medical amenities the people of Assam's tribal regions used to suffer from their almost total lack. It is heartening to note, therefore, that this aspect of development

has received the attention of the Planning Commission. The Plan is expected to meet the following requirements:—

(1) Static dispensaries at important centres offering facilities for treatment of patients from nearby villages. (2) Base hospitals and leprosy colonies where treatment of a higher and more specialized standard can be made available. Pathological laboratories and other diagnostic auxiliaries would form an integral part of the base hospitals. (3) Itinerating Units for the purpose of touring remote areas where people cannot easily reach static dispensaries. (4) Mobile health units and V. D. units with the object of carrying out intensive propaganda on preventive medicine in addition to giving treatment facilities. (5) Malaria being the most prevalent disease in the Agency, the plan has laid special emphasis on its control by providing for a separate antimalaria organization.

Training is proposed to be imparted with a view to encouraging the growth of cottage industries and for this purpose training centres will be opened in all the six districts of the N. E. Frontier Agency. A few training centres have already been established. The subjects taught there include carpentry blacksmith's work, spinning and weaving, tailoring, cane and bamboo work, leather work, pottery, stone masonry, soap making and bee keeping.

The following extract from a recent report which appeared in *The Statesman* throws light on the development of agriculture in N. E. Frontier Agency —

"In agriculture, the major programme comprises the introduction of permanent rice cultivation, introduction of commercial cash crops, supply of improved varieties of seeds, training of agriculturists in improved manurial and cultural practices. Development of new land is an important part of the agricultural programme and it is expected that during the five-year period the production of food crops in the Agency will be very considerably increased thereby. For the purpose of land development and subsidized conversion of shifting to permanent cultivation, supply of improved varieties of seeds and manures and agricultural tools and implements to the cultivators and for the demonstration of improved agricultural practices in the field, as well exhibitions and magic lantern shows, an expenditure of Rs. 2, 32, 000 has been incurred. A Community Development Block has been opened in the Lower Minyong and Lower Padam areas on both sides of the Dihang river in the Abor Hills District."

E. BENGAL'S ECONOMY

The principal cause of the backwardness of E. Bengal's economy is lack of industrial development. Jute provides a good example. E. Bengal grows first class jute, but she has not yet been able to undertake the manufacture of jute goods. The Pakistani Prime Minister, Mr. M. Ali recently visited the province and said it was the earnest desire of his Government to promote and assist the growth of industries there. The Province has now got an Industrial Advisory Council and it should stimulate interest among people in industrial undertakings. Mr. Ali disclosed that British and American oil concerns had done considerable exploration and prospecting work in East Bengal. Referring to the good work being done by the Pakistan Industrial Development Finance Corporation, Mr. Ali pointed out that out of 6,000 jute looms projected to be set up 5500 had already been allotted. The Corporation has sponsored another important project, the Karnafuli Paper Mills at Chittagong. Ship repair facilities will be provided at Khulna at an estimated cost of about Rs. 1 crore. These projects are

undoubtedly very useful, but compared with E. Bengal's needs they are a mere drop in the ocean.

PEACE AND PROGRESS

The critics of the Government mostly look askance at the latter's present policy of accepting financial and other aids from abroad with a view to helping the country on to its feet, for they are afraid that by so doing the Government mortgages our independence to some extent. The allegation may not be altogether baseless in as much as no more than average intelligence is required to realize that our foreign patrons are no humanitarians and so cannot act on a manner prejudicial to their self-interests.

In view of the urgency of the task of economic reconstruction, however, the Government seems well justified in asking for help from abroad and if it wants to maintain the flow of foreign help unimpeded, it has to keep a very strict eye on the law and order situation in every nook and corner of the vast territory it administers. What we mean is that the tragic events which occurred in Calcutta during the first two weeks of July should not be allowed to repeat themselves nor should the State Government be allowed to take any false step which might provide a lever to the hands of those who want to throw the country headlong into chaos. Events of the like nature not only make life intolerable in the areas directly affected, they lower the stocks of our rulers considerably in the estimation of their foreign patrons.

We feel it our duty to warn all concerned that unless the Government succeeds in maintaining peace and creates the impression abroad that it stands on the support of a people who are determined to better their lot in a peaceful manner, India will come to be looked upon by the Government's foreign patrons as another KMT-China not deserving a single dollar worth of aid. The importance of Calcutta in India s economy is too enormous to be ignored, and what happens here may not be dismissed as insignificant in the capitals of India's patron nations. Taking an unbiassed view of things, we would point out that our present rulers, if they really want to improve country's standard of living, ought to exercise the greatest possible caution and tact in their day-to-day administration of the people under their charge instead of rushing in where the British angels failed and so feared to tread. Even though most parts of the country have remained peaceful ever since the transference of power, distressing events too have taken place off and on and in parts the national and international importance of which is undeniably high. These events may not have been unavoidable and the responsibility for them is openly attributed by some to Officialdom's lack of tact.

Prosperity is Peace's twin sister. If you kill the latter, the former is bound to show you a clean pair of heels and in the existing context of our economic backwardness prosperity has to come from across the seas. We should avoid by all means doing anything that might prompt the foreign patrons cry out in disgust, "No more dollars for them, for they cannot utilize them as they should." As a matter of fact, there is a section of public opinion abroad which considers it a bad investment to help a country which is heading towards chaos because of the failure of its rulers to shunt off their charge from their desire to tread the path of radical change. The paramount need to-day is the need for peace and the creation of conditions that might ensure it permanently. If peace fails to prevail, we can hardly hope to set our own house in order nor can we expect our foreign

friends and patrons to sink their hard-earned dollars into bottomless pits.

FORD AID

The Ford Foundation is keenly interested in India's economic development. It has agreed to provide finance for our rural development as per a new agreement with the Government of India, to the extent of 1,041,310 dollars. The following extract from a press report throws light on the details of aids offered by the Ford Foundation and there is no doubt that the responsibility of utilizing them successfully rests squarely on the shoulders of our rulers who must come closer to the people to enable themselves to face up to their task:—

(1) The original agreement between the Government and the Foundation covered assistance by the latter to a programme of rural development, including provision for establishing a minimum of five extension training centres and a minimum of 15 intensive development areas.

The first supplement to this agreement, made last August, covered assistance by the Foundation to the Government to establish a minimum of 25 additional centres to train multipurpose village workers required for the community projects programme.

The funds available under the latest supplement to the main agreement will be utilized as follows:—

Up to $12,630 to be administered by the Ministry of Education towards conducting workshops to train people in simplification of writing for new literates;

Up to $25,050 to be administered by the Ministry of Food and Agriculture (Indian Council of Agricultural Research) towards publication of a journal for village cultivators for three years;

Up to $37,895 to be administered by the Community Projects Administration towards specific workshops associated with in-service training and orientation of staff;

Up to $192,630 to be administered by the Community Projects Administration for a three-year social education project with a minimum of five centres to train specialists in social education assigned to the community projects;

Up to $353,105 to be administered by the Ministry of Health for a four-year public health project to conduct a minimum of three centres to train public health staff assigned to the community projects in educational aspects of village sanitation and health education;

Up to $420,000 to be administered by the Ministry of Food and Agriculture to assist a minimum of five agricultural colleges in India over a three-year period in establishing extension departments to provide systematic class room and field training in village extension work.

IMPORT POLICY

The new import policy of the Government of India, which was announced a short while ago, may appear as contradictory at first sight, being as it is, simultaneously, of rigidity or stability and flexibility, of restriction and liberalization. But the entire policy has had to be so, as the Government is actuated by the desire to serve the interests of consumers and importers on the one hand, and of the indigenous manufacturer on the other. The former's demand for liberalisation had to be met and at the same time caution was needed to safeguard the interest, of the latter who have admittedly an important role to play in the task of keying up the country's economic development.

The Government can hardly afford to liberalize its import policy to a sufficient extent as long as there remains the unpleasant need, as at present, to import enormous quantities of such items as food-grains, mineral oils, machinery, long-staple cotton and raw jute of which there is a real scarcity in the country to-day. Nearly 70 per cent of our exchange resources are absorbed by these items and what is left over is not enough to enable the Government to concede the demands of importers and consumers for more liberal imports. Yet it has to be admitted that the Government has done its best within the existing limitations in regard to liberalizing imports without causing any hardship to the indigenous manufacturers and without in any way defeating the object of import controls. The Government has done well, for example, in decentralising control to a greater extent and liberalising licensing procedure. A large number of goods on which duty is high will be liberally licensed.

Not that restrictions have gone and that for the very simple reason that they are necessary in the interests of our indigenous industries the products of which should be protected from foreign competition as far as possible. But a more liberal licensing policy, such as has been decided upon, has been welcomed by the trade. Decentralisation will minimise hardship hitherto experienced by the applicants for licences. Changes have been made in regard to the validity of the licences issued to the importers and no doubt they are for the better. In regard to quite a large number of items for example the period of validity has been extended from six to twelve months. Newcomers will no longer receive a shabby deal. They can now apply for licences in respect of as many as 44 items.

Importers of certain types of goods will be allowed to import allied goods. This is an advantage which the traders cannot but take kindly to. The importers of fountain pens, for example, will be permitted to import pen inks upto a specified percentage.

An important feature of the new import policy is that the Government have postponed decision on no item. Every item occurring in the import trade control schedule is included in the new policy. This will not only help businessmen ascertain where they stand but go a long way towards curbing the activities of speculators and hoarders.

From the consumer's point of view, removal of rigidity in regard to the issuance of licences will spell benefit in as much as it will lead to a greater and more speedy flow of goods he needs. He can expect, for example, a more steady supply of such goods as oils, currants, fruits, condensed milk, etc.

At present India imports goods worth Rs. 10 crores a month, barring the items mentioned in a previous paragraph which consume about 70 p.c. of our exchange resources. As a result of the new import policy the value of imports is expected to rise by Rs. 50 lakhs per month. The indigenous manufacturers may not quite like it. But who could deny that the element of competition needs to be introduced within judicious limitations to persuade them to improve the quality and standard of their manufactures? Also, the provision for an increased import quota for machinery, not manufactured in India, will help the indigenous manufacturer to set his house in order. More liberal imports of industrial raw meterials will also be of help to him.

NEWSPRINT MANUFACTURE

Quite a huge sum of money flows out of our country at the present

moment on account of the import from abroad of quality newsprint. And yet, as many testify, it may not be impossible for us to meet indigenous requirements, if efforts are made to manufacture this commodity within the country. It is heartening to note that efforts have been made recently to manufacture newsprint in India for the first time from sugarcane bagasse. Consumers of this indigenous manufacture are reported to have certified that the newsprint in question can well stand the strain of the the rotary, its one noticeable defect being its translucence which, they say, needs to be reduced. It is claimed that sugarcane bagasse, available in India, amounts to no less than 1. 5 m tons and the quantity is large enough to enable us to be self-sufficient in newsprint provided we care to utilize just a fraction of the indigenously. available raw material for the manufacture of newsprint. The newsprint in question was the result of experiments carried out by the Forest Research Institute, Dehra Dun. It is said that the Institute has successfully solved the problem of removing pith from bagasse. 30 p.c. bamboo pulp made by the Institute was mixed with 70 per cent. bagasse pulp and the actual manufacture of newsprint was carried out at a paper mill at Jamnagar.

THE PLYWOOD INDUSTRY

The Indian plywood industry's chief weakness at the present moment is that its plants are small and intended for tea chests only. But 1952 proved to be a very bad year for the tea industry and the prices of tea fell to very low levels. Even though the crisis has been overcome for the time being, the plywood industry will be well advised not to confine itself exclusively to the manufacture of tea chests. It must widen the sphere of its activities, and as suggested in the recent address of the President of the Plywood Manufacturers' Association of India, it should stop depending on the tea industry and produce a certain percentage of plywood for other uses as well. Cheap household furniture can be made from plywood, which will be well within the purchasing power of the country's people. Referring to the excessive capacity of the tea chest industry Mr. N.N. Bose, President, Plywood Manufacturers' Association, said that it stood at over 9 million tea chests as against internal consumption of about 5 million, and so the need for control is evident.

Plywood manufacture is steadily going up and in the next two or three years we may be in position not only to meet internal demands but export a good quantity of it. If and when this is possible, further protection will not be called for.

Mr. Bose expressed his satisfaction at the Government's decision not to allow any import of foreign made tea chests in the first half of 1953. In the second half of the year 5% imports will be allowed. Mr. Bose advised the Government that licences for imports should not be granted immediately. At present the demand for tea chests of all varieties, indigenous or imported, has gone down considerably and there is no reason why any import should be allowed so long as the demand has not been keyed up sufficiently to justify it.

Mr Bose concluded by referring to the good work now being done by the Association's Laboratory and Test House and its Journal "Plywood" which has just seen the light of day.

CHROMIUM PLATING

The hardness, tarnish resistance and brilliance of electro-deposited chromium make it suitable for diverse uses. Advantage is taken of its hardness and low wear rate in applications such as tools and moving mechanical parts. Its brilliance and tarnish resistance are contributing factors in its widespread use on automobile trim and plumbing fixtures. Worn parts, built up with chromium, have given up to ten times the wear of the original part. The increase in wear resistance in most of these applications is due to the hardness of the deposit. However, in other applications, such as cutting tools, the low coefficient of friction of the chromium is equally important.

In engineering applications, reference is often made to hard or industrial chromium and also to bright chromium. In ordinary plating practice, hard and bright chromium are one and the same, for bright deposits are hard and in addition, the control of the hardness of the deposit is too difficult for the average plater.

Actual control may not be difficult if means are available to measure hardness, but the measurement of hardness of thin chromium deposits is too difficult for control purposes. The same bath is used to plate 'hard' and 'decorative' chromium. In fact, it may be said that there is only one chromium bath. By changing the concentration, the temperature and the current density, the characteristics of the deposit can be changed.

FORMULATION

The chemistry of a chromium bath is simple. Chromic acid is added to water to supply the chromium metal and a small amount of sulphuric acid is added as a catalyst. The bath does not require "free" chemicals and does not build up in products of electrolysis as chromium is removed. Insoluble anodes are used, chromic acid is added when needed and definite ratio of CrO_3 to H_2SO_4 is maintained. The baths most commonly used contain either 33 ounces per gallon or 53 ounces per gallon of CrO_3 and the CrO_3 to H_2SO_4 ratio is maintained at approximately 100 to 1.

OPERATION

The operation of a chromium bath is relatively simple, but as in all baths there are certain characteristics that must be watched. The solution, in addition to being a plating bath, has fair cleaning action and can also be used to etch if the steel is treated anodically in the bath. Not only will it etch steel on anodic treatment , but the etching action is more effective on many alloy steels than with the more common methods of etching. In the common etching methods, using hydrochloric or sulphuric acid, a smut is often left on alloy steels which, if not removed, may cause poor adhesion between the steel and the electrodeposited overlay.

Since the chromium bath has the combined features of cleaning, etching and plating baths, it may be used as a complete plating line with the addition of nothing more than a rinse tank. To illustrate the simplicity of operation, it is well to consider how some manufacturing plants use the bath for salvage of tools. The steel to be plated is immersed in the bath and treated anodically until the desired etch is obtained. The current is then reversed and the steel treated cathodically until the desired thickness of plate is obtained. Chromic acid baths

have been used in this manner for limited plating in the vicinity of the plant tool-salvage department. This practice, however, is not recommendded for continuous plating or for large-scale plating.

For continuous quality chromium plating, it is necessary to take the bath characteristics into account. The outstanding characteristic of the chromium bath is its limited plating range. The plating range is limited because the covering power and throwing power are low. Also the plating range shifts with change in bath conditions; particularly does the plating range shift with change in temperature or change in current density. However, a shift due to change in temperature can be compensated for by a change in current density. As the temperature is increased the current density must also be increased.

Since the current does not distribute well over the cathode, it is essential to use an average current density well within the range and to increase the current density as the temperature is increased. It is convenient to express the current density in amperes per square inch since the current density is high by comparison with other still-plating baths.

BATH COMPONENTS

The concentration of sulphuric acid in the chromic acid bath is very low it only serves as a catalyst. Its effect on the conductivity of the bath is negligible. However, it is very important that the recommended ratio of CrO_3 to H_2SO_4 is maintained. The ratio may vary from 50: 1 to 250: 1 but in most cases, satisfactory results are obtained if the ratio is held at approximately 100: 1. It is imperative that the catalyst ratio is held at an optimum since the plating range of the bath is narrow even under the best conditions.

The chromic acid bath will not plate at all unless the special requirements of catalyst are met. However, if the chromic acid to catalyst ratio is held within proper limits, the behaviour of the bath then depends only on the chromic acid. The chromic acid is the source of metal and also provides for the conductivity of the bath, which is good. Since with an optimum concentration of catalyst, there is only one other component present, little can be gained by changing the chemical content of the bath. The dilute bath has a higher current efficiency than the concentrated bath, but a higher voltage is required for its operation. The different in power savings between the dilute bath and concentrated bath is small.

MATERIALS OF CONSTRUCTION

Chromium-plating tanks may be either lead or brick lined. Antimonial lead or lead-tin-alloy linings are more resistant to corrosion from the bath than chemical lead. The lead or lead-alloy linings are susceptible to the effects of stray currents which may cause chromium to deposit on the lead, may rob the cathode of current, may allow current to flow to areas on the cathode where it is not desired and may accelerate corrosion of the lining. However, if proper precautions are taken, the lead linings are satisfactory and will last for years. Brick lining has the advantage of eliminating stray currents, but it is more difficult and expensive to install than lead.

BATH PREPARATION

The preparation of the bath is relatively simple since the chromic acid is readily soluble. After the chromic acid is dissolved and the proper amount of sulphuric acid added, the bath is ready for use. Filtration is not required, although, it is well to decant the bath occasionally to remove the sludge that accumulates with

use. Following table gives the specific gravity readings corresponding to various CrO_3 concentrations.

SPECIFIC GRAVITY AND CHROMIC ACID CONTENT

Specific Gravity at 15°/4°C.	Baume at 60°F.	CrO_3 oz./gal.
1.13	16.7	24.8
1.14	17.8	26.8
1.15	18.9	28.8
1.16	20.0	30.6
1.17	21.1	32.6
1.18	22.1	34.4
1.19	23.2	36.4
1.20	24.2	38.6
1.21	25.2	40.3
1.22	26.2	42.3
1.23	27.1	44.2
1.24	28.1	46.2
1.25	29.0	48.2
1.26	29.9	50.2
1.27	30.8	52.2
1.28	31.7	54.5
1.29	32.6	56.5
1.30	33.5	58.7
1.31	34.3	60.7

The presence of trivalent chromium and iron will affect these readings.

ANODES

Lead, lead-tin or lead-antimony are used in practice. These lead or lead-alloy anodes are insoluble in the bath. However, during operation, the surface of the anodes becomes covered with a film of lead peroxide which will oxidize any trivalent chromium present.

Iron anodes are occasionally used in applications where the weight or physical characteristics of the lead-alloy anodes are objectionable. The build-up of iron in the bath, however, will eventually necessitate dumping of the bath.

The chromic acid bath is a good example of how a bath is operated by a knowledge of its simple variables. If the following characteristics and variables are kept in mind, it will be found that the optimum operating conditions can be obtained.

1. The bath operates at a high current density.

2. If the current density is increased, the temperature must be also increased.

3. If the current density is increased, the plating rate will be also increased.

4. If the current density is increased, a higher voltage is required.

5. If the plate is bright, it is also hard.

6. The throwing power is poor.

The operation of the bath can be best illustrated by examples.

Let us assume that it is desired to plate O. 1 mil of chromium on steel and that the plating rate is not important. in a 33 ounce per gallon bath, a bright plate will be obtained at O.75 ampere per square inch and it will take about 12 minutes to deposit O. 1 mil. If the bath has a number of parts in it so that the total cathode area is large, the bath temperature will increase because of the resistance of the electrolyte. If the bath gradually increases in temperature to 105°F., it may be necessary to increase the current to 1 to 1.5 amperes per square inch and to cut the plating time to 8 minutes to maintain a bright plate. This will cause future heating and require further increase in current so that, with continuous operation, the bath may come to equilibrium at approximately 120°F., at a current density of 2 amperes per square inch and a plating time of 6 minutes.

From this example, it can be seen that conditions will have to be continuously changed if appreciable total current is used. It is troublesome to continuously change the current density and the plating time. Therefore, for the above applica-

tion, it would be more satisfactory to heat the tank to 120°F. before starting operation and to cut the heat input as heat is supplied from the electrolysis. If a large area of work is to be plated, it is necessary to have both heating and cooling coils. Tables are available for the plating rates of chromium baths and they should be used as a guide. However, the tables were determined under conditions of uniform current density and give only approximate values for irregular cathodes. In practical applications, a prepared rack is placed in the chromium-plating tank at the proper temperature and the current density is inceased until the plate becomes bright. The total current or voltage is noted and this or some slightly higher value is used for operation. From the temperature and the range of brightness at that temperature, the approximate plating rate is estimated from the tables. The actual plating rate is determined by measurement of the thickness of the deposit.

The major problem in chromium plating is current distribution which requires special attention to racking and to anode positioning in order to compensate for the poor throwing power of the bath. If complicated shapes are plated, a complex anode must be made by bending lead strips or wires to approximately conform to the contours of the cathode.

PREPARATION OF THE BASIC METAL

For plating on ordinary steel, the common cleaning and pickling processes are satisfactory prior to plating. Alloy steels that are used for tools cannot be properly prepared by this simple procedure, but most alloy steels can be satisfactorily plated if they are anodically treated in a chromic acid bath prior to plating. All alloy steels may not respond to the same treatment although most of them do. For other surfaces, such as nickel and copper-base alloys, a cleaning, pickling and anodic treatment will have to be determined. Many cathode surface do not readily or properly receive a chromium plate unless they are specially prepared, but methods are availabe for the preparation of most surfaces.

CHROMIUM PLATING SOLUTIONS

		g./1.	oz./gal.
1.	Chromic acid, CrO_3	250	33.5
	Sulphate radical (SO_4)	2.5	0.33
2.	Chromic acid, CrO_3	400	53
	Sulphate radical (SO_4)	4	0.53

Temperature for above baths, 40 to 55°C. (104 to 131°F.). Current density, 10 to 25 amp. per sq dm. (93 to 233 amp. per sq. ft.).

The sulphate radical may be supplied by sulphuric acid or by sodium sulphate. it may also be supplied by chromic sulphate, but difficulty is experienced in obtaining it in a pure form and it is little used. The sulphuric acid and sodium sulphate, when pure, required for the above baths are as follows:

In plating solution the 2.5 g. per liter of SO_4 will be supplied by 2.55 g. per liter (O.34 oz. per gal.) of sulphuric acid or by 3.7 g. per liter (O.49 oz. per gal.) of sodium sulphate. In solution 2, the 4 g. per liter SO_4 will be supplied by 4.1 g. per liter (O.55 oz. per gal.) of sulphuric acid or by 5.9 g. per liter (O.80 oz. per gal.) of sodium sulphate. However, the chromic acid generally contains some sulphate which should be determined and allowed for in adding the sulphuric acid or sodium sulphate.

To insure a bright chromium deposit and also maximum efficiency, the CrO_3 and SO_4 should be present in the bath and

maintained in the approximate ratio of

$$\frac{\text{Weight of } CrO_3}{\text{Weight of } SO_4 \text{ radical}} = 100 \text{ or thereabouts.}$$

The efficiency of plating is generally below 15 per cent.

For proper electroplating of chromium, the correlation and control of solution composition, temperature, and current density are very important. When the CrO_3 and the SO_4 in the bath are in the proper proportion, satisfactory plating can be obtained in most baths at temperatures ranging from 40 to 55 deg. C. (104 to 131 deg. F.), but the proper current density must be maintained for the particular temperature employed. If the current density is low, the deposit is milky; if high, the deposit is frosty. The current density half way between the limits of milky and frosty deposits, that is, half way between the limiting current densities, will produce a bright deposit. For baths 1 and 2 operated at 45 deg. C. (131 deg. F.), the current density for bright deposits on copper or brass is 6 amp. per sq. dm. (150 amp. per sq. ft.). In the plating of chromium on copper or brass, it is desirable that the introduction of the cathode close the plating circuit to prevent an attack on the metals by the chromic acid.

The throwing power in chromium plating solutions is poor, and difficulty may be experienced in obtaining a uniformly smooth deposit on some irregularly shaped articles. If the overvoltage of hydrogen on the metal to be plated is high, irregularly shaped articles can be plated more readily with a bright deposit than if the overvoltage is low. Recessed articles of copper or brass can be plated with a uniformly bright chromium deposit more easily than can those of nickel or steel. If the cathode be introduced into the bath in such a manner that its immersion closes the plating circuit, the throwing power is improved on metals like nickel and iron which have a tendency to become passive in the chromic acid bath. Throwing power can in some cases be improved on the latter metals if the articles to be plated are polarized anodically a minute or two before plating. Sometimes it may be necessary to use auxiliary anodes or to shape the anode similarly to that of the surface to be plated.

Chromuim anodes are not used commercially in chromium-plating solutions. Chromium has a tendency to dissolve too readily when used as anode, and it is more expensive to supply chromium as anodes than to use the acid. It is therefore more economical to supply the chromium ions by introducing the CrO_3 into the bath directly. Chromic acid must therefore be added periodically to maintain the chromium content. In some cases a hydrometer is used as a basis for determining the chromium content; solution 1, above, has a specific gravity of about 1. 18 (22.1 deg. Be), but frequent chemical analyses of the solution for the chromic acid content, as well as for the acid radical content (SO_4), are very desirable. The content of CrO_3 should not be allowed to drop more than 10 per cent below its original concentration. Lead and sometimes anodes are used commercially, the former being preferred, 1 8, 2 4 for the lead does not contaminate the bath. The anode area should be as large as possible.

During the plating operation hydrogen is evolved at the cathode and oxygen on the anode. This evolution of gas forms a fine spray of acid which if allowed to pass off into the room is harmful to the operations. Special ventilation is therefore important in chromium plating. Ventilating ducts should be placed directly along the upper edges of the tank.

Chromium plate, like practically all electroplated deposits, is porous, so that

outdoor use it is not the practice to posit chromium directly on iron or steel, cept on stainless steel. At some plants non-porous intermediate layer is plated. the article to be plated is a non-porous tal, nickel forms an ideal intermediate ite, owing to its relatively impervious posit and its resistance to corrosion in atmosphere. Also, nickel can be desited to produce a fine-grained surface ich can be highly coloured (polished) is serving as a desirable base for chroum, which will deposit in a layer requir- no further polishing. If the base metal porous, such base metals should be ven a light deposit of nickel, followed a heavy coat of very soft copper. The rface of the copper should be followed uffed) on a polishing wheel to close the res. This should again be followed by a coat of nickel. This nickel is then highly coloured and plated with chromium.

Chromium plating on nickel requires about 5 minutes or less for decorative articles, but the plating of the undercoating of nickel requires about 40 minutes.

Chromium plate on zinc is unsatisfactory, owing, as believed by some, to the zincification of the chromium. This also is true when chromium is plated on brass. If the deposit is thin, the chromium will disappear in a few months. If the chromium is thick, a dark-coloured supposedly chromium-zinc alloy is formed between the zinc and brass this layer is non-adhesive and results in subsequent peeling off of the chromium. For first-class work, therefore, zinc and brass are given a coat of nickel. Chromium can be successfully plated on aluminium.

The following table as prepared by Griffiths, gives the commercial procedure for oducing chromium finishes.

COMMERCIAL ELECTROPLATING PROCEDURE

A—Grinding polishing, or buffing.
B—Wash with organic solvent.
C—Hot alkaline wash.
D—Alkaline electrolytic cleaning.
E—Alkaline electrolytic cleaning containing sodium and copper cyanides.
F—Muriatic acid dip.
G—Hand pumice scurb.
H—Sulphuric acid dip.
K—HF dip.
Cu—Acid copper plating.
Cy—Cyanide copper plating.
Ni—Nickel plating.
Cr—Chromium plating.

Plant.	Base Metal.	Coatings (In order applied).	Sequence of Operations.
Mfg.	Steel	Ni	A-D-F-Ni
Mfg.	Steel	Ni	A-B-D-F-E-Ni
Bumpers, etc.	Steel	Ni-Cu-Ni-Cr	A-D-F-G-F-Ni-A-Cr
Auto.	Steel	Cy-Ni-Cr	A-D-F-Cy-A-C-H-Ni-A-C-Cr-A
Auto.	Steel	Ni-Cu-Ni	A-E-Ni-Cu-A-C-Ni-A
Auto.	Steel	Cy-Ni	A-Cy-A-C-Ni-A
Radiators, etc.	Steel	Cy-Cu-Ni-Cr	A-G-D-F-Cy-Cu-A-G-D-F-Ni-A-Cr
Auto.	Steel	Ni-Cu-Ni-Cr	A-D-F-Ni-Cu-A-Ni-A-Cr
Auto.	Steel	Cy-Ni-Cr	A-D-F-G-Cy-A-D-F-C-G-Ni-A-D-Cr
Mfg.	Steel	Cy-Ni	A-E-F-Ni-E-F-Ni
Auto.	Steel	Cy-Ni-Cr	A-Cr-D-E-Cy-Ni-A-D-H-Cr
Auto.	Brass	Ni-Cr	A-D-C-F-Ni-A-D-Cr

Moulding and Manufacturing Processes of Plastics

All the plastic materials which are available are designated as either thermo-setting or thermo-plastic. The characteristic feature of the thermo-setting varieties is that due to changes which take place in the molecular structure, upon the application of controlled heat, they set hard and remain permanently set in the chosen form. With the thermo-plastics, heat is used as a softening agent only; hard setting takes place with cooling.

Thermo-setting compounds are moulded by the compression method, in which the application of heat and pressure serves to plasticize, press into shape, and subsequently harden the compounds; a special adaptation of the injection process known as transfer moulding is also used. The thermo-plastic are moulded by either the compression or injection method, and both types can be manipulated by the extrusion process.

COMPRESSION MOULDING

The three most important factors governing the production of mouldings by the compression process are the degree of pressure applied, the temperature at which moulding is carried out, and the time taken for the pressure and heat to affect the moulding composition. All three factors have to be rigidly controlled. The pressure required varies considerably with the size and shape of the moulding and with the type of material used. Pressures from one to six tons per square inch are utilised.

Both temperature and time also vary within fairly wide limits. The higher the temperature the lower the time factor. A temperature range of between 140°C.-180°C. is usually provided for, and under such conditions a moulding of one millimetre thickness would be produced in twenty to sixty seconds; it does not follow from this. however, that a moulding of two millimetres thickness will take twice as long.

In the modern factory, where high speed production work is carried out, automatic presses are used. These are capable of operating on multi-impression moulds and are fitted with automatic ejectors to throw out the articles as they are completed. When these ejectors are not fitted, the work is either removed by projecting a stream of compressed air down the side of the mould or, alternatively, straightforward removal by hand is adopted. Hydraulic presses are used because they have been found to be most suitable for supplying the continual pressure needed to "follow up" the change in volume which takes place when the moulding composition begins to flow.

If the moulding has been carried out correctly the article will have a surface finish which is an exact reverse of that of the mould, and will be impervious to the further effects of heat within the limits given for the material used.

Though the process may appear very simple, great care has to be taken to ensure that the correct relationship between heat, pressure and time is maintained. Any mistake in this respect will lead to the production of mouldings which are useless. They will lack mechanical strength, and their electrical proportion will be unreliable. Badly processed mouldings also suffer from blistered and distorted surfaces.

INJECTION MOULDING

Injection moulding differs from impression moulding in that the moulding compound is fed continuously into the heated chamber, through which it is injected into the mould automatically. The processes of feeding in the material, heating, and injecting it into the mould, are all controlled automatically, and very high production speeds can be attained.

The moulds for injection moulded parts are nearly always multi-impression types, whereby any quantity from say four to sixty identical articles can be moulded in one operational cycle. One or more feeds for the material are arranged, and all the mould cavities are connected together by channels through which the material is squirted at high speed. When the mould is opened the articles being moulded are all joined together by the material which has flowed, and set in these channels, or runners, as they are called, and the complete assembly is ejected from the mould automatically.

In the process of injection moulding no chemical change takes place in the moulding material, and the speed with which mouldings can be produced is only governed by the mechanical limitations of the machnie and the time which has to be allowed for the moulding to set sufficiently hard for it to be ejected. On the other hand, setting up the machine is more difficult than setting up a press for compression moulding. The moulds, too, are more complicated. Consequently injection moulding is only adopted when the number of impressions required warrants its adoption. The quantity required must run into tens of thousands before injection moulding is an economical proposition.

TRANSFER MOULDING

The transfer moulding process is modified form of injecton moulding; it is, in fact, injection moulding as applied to thermo-setting compounds.

A pre-heated, partly pre-formed tablet of the plastic material is placed in the loading chamber, and as the temperature is raised to the flow point of the plastic, pressure is applied to transfer it from the loading chamber to the mould. The bottom half of the mould is withdrawn to remove the article when the moulding cycle is completed.

The advantages claimed for the process are that it ensures a more uniform flow of the plastic around delicate and accurately spaced inserts, thus stresses are avoided; correct "curing" of all the compound is assured, even when the article being moulded has considerable bulk and varies from thick to thin sections along its width. Wear and tear on the mould is less than with the ordinary compression process, particularly when the article required contains small and fragile inserts. Another advantage from the cost aspect is that there is no waste material. Dimensional accuracy is assured because there is no tendency for the plastic to distort insert pins and fittings whilst it is still in the hard state, or between the power and liquid stages. In transfer moulding the plastic is in a highly plastic state before it enters the mould.

EXTRUSION

Extrusion of both thermo-setting and thermo-plastics is carried out. The processes adopted for the thrmo-plastics are fully described.

Thermo-setting resins, particularly phenol compounds, are extruded in various cross-sectional designs and in continuous lengths. The plastic is heated to softening point as it enters the die, and to the "curing" temperature as it leaves. The rate of extrusion depends on the cross-sectional area, but an average figure is ten

inches per minute. The properties of extruded thermo-setting resins are much the same as apply to wood flour phenolic and urea-formaldehyde.

HIGH FREQUENCY OR INDUCTION PRE-HEATING

The two standard methods of heating plastic materials for compression moulding purposes make use of steam and electricity. The steam is applied through a system of jackets surrounding the mould and press platens, and electrical heating is carried out with ordinary heating elements built into the mould and press platen assembly.

To reduce the time taken to raise the plastic material to the required temperature, when it is in the press the powder is formed into bricks or pellets which are pre-heated in an oven which is installed close at hand. The time taken to heat the plastic pre-forms in the oven is longest part of the complete moulding cycle. With the oven method of heating referred to above, the heat is applied to the outside of the material and gradually penetrates inwards. The temperature prevailing in the oven must not exceed that which will harden the resin, and the safe temperature for most pre-heating operations is in the neighbourhood of 65° C. This means that if the block of material is large the temperature at the centre of the block will be considerably lower than this. Therefore, there is a limit to the usefulness of oven pre-heating as a factor in reducing the total heating time required.

Recently a new method of pre-heating has been developed which promises to play a large part in production operations in the future. The success of the new method, which is known as High Frequency or Induction Heating, is based on the fact that when an alternating current high frequency is passed through a material, in certain circumstances it will generate heat in the material. This heat generation is uniform throughout the material. High temperatures can be reached in a very short time.

Apparatus has been designed to take pre-formed blocks of moulding compound and heat them to a temperature closely approaching the flow point in a few minutes. Because of the near plastic state of these blocks when they are fed into the mould cavity, the time taken for the moulding cycle to be completed is considerably reduced.

The general adoption of high frequency heating will enable a high rate of production to be achieved, and will confer other advantages also. Moulds containing delicate inserts are less liable to be damaged by material which is adequately softened before subjected to pressure, and the risk of incomplete processing is entirely eliminated.

High frequency or induction heating has been adopted extensively in the United States, and an increasing amount of interest is being taken in the development in this country.

The cost of suitable plant, however, is considerable, and despite the time saved it does not always follow that the adoption of the method is an economical proposition. The amount of electric power dissipated to obtain a given degree of heating will cost more than obtaining the same heating effect from another source. The heat is generated more quickly, however, and thus overheads on other parts of the plant, and payment to operators, are reduced.

As pointed, very little heat is dissipated in passing a high frequency current through a good high-frequency insulator (i.e. one with a low power factor and low dielectric constant) and it therefore follows that such materials as polystyrene and polythene cannot be successfuly or econo-

mically plasticized by the high frequency heating methods. The better a material is from the radio engineer's point of view, the less chance there is of it being worth while to adopt high frequency heating as part of the moulding process.

In practice the materials which are most suitable for processing by the method are the ordinary grades of phenol-formaldehyde, and urea-formaldehyde plastics.

Formula worked out by the Westinghouse Electric and Manufacturing Co. Ltd., of Pennsylvania, for calculating the heating in dielectric materials, was published in "Plastics" (May, 1945) as follows:

$$W = \frac{1.41\ AfE^{2}e^{11} \times 10^{12}}{d}$$

where W = Rate of heating in watts.

A = Areat of the electrode in sq. inches.

d = Thickness of material in inches.

f = Frequency in cycles per second.

E = Voltage R.M.S.

e^{11} = Loss factor of material (= e^{1} + an 8).

e^{1} = Dielectric Constant.

It will be seen from the above formula that frequency and loss factor play a vital part in determining the degree of heating which will take place in relation to watts dissipated.

The same paper gives the practical lower limit for the loss factor materials which can be heated by high frequency methods as between .005 and 0.01. It will, therefore, be seen that since materials such as polystyrene and polythene, quoted above, have loss factors between .0001 and .0005, they are well outside the practical range.

MACHINING AND OTHER METHODS OF WORKING PLASTICS

In addition to the moulding and extruding processes described above, plastics which are available in sheet [...] be machined and manipulated, [...] the same manner as sheet metals. [...] *quantities of shaped, punched anc [...] plastic articles are used in all cla[...]* electrical and radio apparatus.

Phenol resin laminated sheets [...] sawn, shaped, drilled, tapped, turn[...] machined on ordinary machine [...] equipment.

Because all types of phenol she[...] of laminated structure, splitting anc[...] ing of the laminations must be gu[...] against. The sheets come so near to [...] a solid block that this splitting can [...] occur if the material is treated br[...] The authors have had dozens of [...] cases of thoughtless treatment brou[...] their notice, usually by workmen, w[...] emphatic in their denunciation o[...] materials. When such cases have [...] investigated it has usually been foun[...] either the workmen started off with [...] judice against the material, or al[...] tively, he has been unaware of, or [...] disregarded, the manufacturers' in[...] tions with regard to processing proc[...]

Splitting or flaking of the outer [...] of the material will occur if binding [...] is set up by an incorrectly shar[...] drill, or if an attempt is made to pu[...] drill through the material too q[...] The drill should be sharpened so [...] allow ample clearance for the swarf [...] away, and because of the overh[...] which takes place an excessive feed [...] should be avoided. Burrs round the [...] of the holes are caused by the [...] treatment, and if such burrs do occu[...] can only be removed by either co[...] sinking the hole (taking care not t[...] another burr in so doing) or by sand[...] ing the article. If the latter exped[...] adopted the finished surface of the [...] will be damaged beyond repair, a[...] previously explained, this outer [...]

endows certain grades with their anti-moisture absorption properties. In both tapping and drilling operations great care should be taken to avoid overheating and the consequent faults.

The use of a band saw is quite permissible. Large holes can be made by "trepanning", and the intricate shapes can be punched from certain grades, which are produced specially for this purpose. One or two of the paper varieties are suitable for punching, and so also are the fabric base types in which fine texture cambric has been used. The sheets are usually warmed, either on a plate or by immersion in oil, before the punching operation is carried out.

SHAPED PHENOLIC SHEET

Because of the high cost moulds, and the difficulties associated with moulding large articles, processes have been developed whereby it has been made possible to mould or form phenolic sheets into shape before the final "curing" of the material has taken place. Tapered streamlined sections for aircraft aerial masts, shallow boxes, and many other large articles can be handled by the shaping process. Details are as follows.

Laminated sheet is prepared in the usual way, except that the final temperature and pressure cycle, which is applied to ordinary sheet to polymerize the resin, is not carried out until after the laminated sheet has been formed to the shape required.

Forming of small articles can be carried out by the use of male and female forming blocks, but a different method is adopted for large articles. A steel female mould of the shape required is prepared and arrangements are made for this to be heated. This mould is erected in a tank or chamber in which it is possible to build up a considerable pressure of steam. The laminated sheet is then placed on the mould and covered with a rubber blanket. The chamber is then sealed and steam is admitted. The combination of heat from the mould and the pressure of the steam on the rubber blanket results in the laminated sheet taking up the shape of the mould. It is held to this shape until "curing" is complete. There are numerous variations of this method, nearly all of them embodying a rubber blanket or "inflated" bag, and similar processes are used for shaping phenolic resin bonded plywood.

There has been a limitation on the shapes which can be produced by this method, however, because the paper and fabric used to make-up the laminated sheets can only be subjected to a small amount of stretch or pull in any two directions at once. Compound curvatures of any depth cannot be produced. Sheet materials of pure plastic, such as cellulose acetate or perspex, can, of course, be drawn to considerable depths.

The disadvantage referred to above has now been overcome by the introduction of a patented form of sheet material which employs a material which is made up of a number of layers of "knitted" fabric.

When this new material is made available in large quantities it will be possible to produce all manner of complicated and original designs, for radio cabinets, furniture, advertising display work, domestic electrical appliances, etc. The advantage that this material has over the similar product moulded from powder materials is that of strength. The risk of breakage will be practically non-existent.

STEEL SHOT MOULDING WITHOUT MOULDS

A method of moulding a protective coat of any of the phenolic plastics, around

coils and armatures, was developed by the B.T.H. Co., at Rugby, and was given publicity in the monthly journal 'Plastic'. The scheme makes use of the fact that steel shot, when packed in a box or container, transmits heat in the same manner as a solid steel mould. The article around which it is desired to from a plastic shell is first coated with plastic compound and then is supported in a box and surrounded by steel shot. The application of heat serves to harden the resin, and the steel shot is then removed. When the steel shot is first loaded into the box it is, of course, packed in tightly and under pressure. The advantage of the scheme lies in the fact that a thin moulded coat can be applied to articles of any shape irrespective of undercuts, and no expensive moulds are required.

Moulding without mould is of course, moulding without the major item of expense, and it is therefore possible to deal with very small quantities and still retain the advantage of heating a moulded article.

PULP AND PREFORM MOULDING

Pulp and preform moulded products are not used to any great extent by either the Electrical or the Radio Industry and until recently pulp moulded products have only been suitable for decorative and superficial structural purposes. The strength, mechanical and electrical, of the older types of pulp moulded products were not up to the standards required for the applications in which we are mainly interested. Improvement in the manufacturing technique and the increasing use of superior synthetic resins in pulp moulding processes have led to an increase potential usefulness of these products, however, and a brief description of the way in which they are manufactured and their characteristics follows

Pulp moulding is carried out by mixing cellulose products with a water-resin mixture in tanks, and the shapes required are obtained by sucking the pulp on to a wire mesh template or mould until the thickness required is built up. The wire mesh mould is then removed from the tank, and the preformed pulp shape is prised off, and placed in a press for final shaping and dyeing operations. When a synthetic resin of the phenol-formaldehyde type is used polymerization of the resin is carried out in the press, in a manner similar to that applicable to laminated sheet products. The use of special resins, polymerizing at lower temperatures than the normal resins, and the fact that there is no necessity to have very high pressures, enables the pulp moulder to utilize wood moulds in the press.

One form of pulp moulding plant makes use of a suction line, attached to a flexible tube, and pump. The wire mesh mould shape is fixed to the suction line and lowered into the tank. There are, of course, very many variations of the processes described, and the moulding can be carried out on a very efficient production basis.

The pulp moulding system enables large articles to be manufactured without the disadvantage of high tool costs, and the properties of modern resin impregnated pulp products are comparable with those of laminated sheet and power moulded products. Pulp mouldings are not brittle, and there is no waste. Resin which is squeezed out of the pulp-form when it is first removed from the tank and placed in the press is returned to the tank for re-use. Lamp standards and ornamental fittings, switchgear housings, radio cabinets, and a variety of other articles can be produced by the methods described.

The British journal "Plastics," quoting from the "Iron Age," gives the proper-

ties of pulp moulded products, as compared with other types, as follows:—

Type.	Tensile Strength lbs. per sq. in.	Flexural Strength lbs. per sq. in.	Impact Strength
Preformed	14,000	18,500	65
Laminated	14,000	20,000	54
Moulded	7,000	10,000	36

The preformed type referred to above is that produced by the Westinghouse Research Laboratories and the Mellon Institute of Industrial Research in Pittsburg, U.S.A.

Another preform method of moulding has been in use for some time in this country, but it is only recently that synthetic resins have been used to improve the quality and durability of the product.

This method consists of building up the shape required on a plaster mould, by taking strips of paper and pasting them on one after another until the thickness required is obtained. The strips of paper are cut and scored to settle round bends and awkward contours and a product of considerable strength results from the use of the continuous, long fibre strips. If the paste used has a resin content and provided that the article being made is given final processing under pressure to increase the homogenous nature of the structure and polymerize the resin, a very durable product is obtained. Vizors and hoods for cathode ray tubes have been made by this process.

SPRAYED PLASTICS

A considerable amount of development work is being carried out at the present time to evolve satisfactory production methods of spraying plastics on to wood, metal and other surfaces, without the use of a solvent. Soluble resin solutions, for spraying and doping with thermoplastic resins such as cellulose acetate have been in use for some time, and the spraying of radio and electrical equipment with phenolic varnishes is now being carried out on an extensive scale, for tropic proofing purposes. The varnishes, used however, all contain solvents, and time has to be allowed for these to dry off. There is also the ever present risk of damage being caused by the solvent to the articles being sprayed. Methylated spirit, for example, is a solvent widely used for shellac varnishing. Methylated spirit attacks the enamel for covering copper conducting wires, and one inexperienced school-boy radio engineer many years ago learnt this fact much to his cost. The engineer concerned, who shall be nameless because the memory is still very vivid, wound a transformer on the kitchen table and literally doped every layer of the winding with shellac varnish, thinned out with methylated spirit. Winding was completed, after a few minutes the mains voltage was connected, with the result that the fuses all blew, the kitchen table caught fire and the local fire brigade was called out. The sequel to this occurrence was quite painful, and no more pocket money for radio research was forthcoming for a long time.

The development of a process enabling solventless plastics to be sprayed would be a major technical advance. There are many applications where the use of a sprayed plastic coat would be preferable to the present practice of using stoved enamels wates, layers of impregnated paper, etc.

The present position is that bitumen, and certain synthetic rubbers can be sprayed satisfactorily, and some operating Companies are carrying out such spraying on a proper production basis. Patents have been taken out for spraying

polythene, and E.E. Hall, in "Plastics" (Jan., 1945) illustrates an article on the subject with pictures of synthetic rubber coated articles.

The technique of spraying solventless thermo-setting phenolic plastics is not yet fully developed, but reference to the value of solventless varnishes is made and it will be readily appreciated that the efficiency of transformers, coil windings, electric motor assemblies, and a host of other pieces of apparatus will be immeasurably improved if the spraying technique is developed satisfactorily.

PROCESSING CELLULOSE ACETATE

Cutting, drilling and punching operations are easily carried out on cellulose acetate when the material is cold. Due attention must be paid to the recommendations of the manufactures when carrying out these operations if 100% success is to be expected. Cutting operations, for example, are best carried out on material which has been slightly warmed, and special drills are needed for economical working.

Cellulose acetate shows a tendency to brittleness at low temperatures, but at prevailing ambient temperatures in this country it can be guillotined without preheating. Thick sheets, however, should be warmed, by immersion in warmed water, for best results.

When drilling and punching cellulose acetate the material (unless thin) should be warmed. Holes can be drilled, using any standard drills.

A fly-press can be used for punching operations.

Grinding processes involve no difficulty, but only certain types of abrasive wheels are suitable. The only type of grinding wheel which the manufacturers advise is one made of Silicon Carbide. Composition wheels, even though they may contain some Silicon Carbide, are definitely not recommended.

Compression moulding of small articles in cellulose acetate can be carried out by one of two methods, known as "wet moulding" and 'dry moulding' respectively. The essential difference between the two methods is that in the wet moulding process hot water is used to soften the material, and the operation takes place at a temperature in the neighbourhood of 80°C., whilst dry moulding is carried out at a higher temperature (130°-140°C). on discs or blanks which have been dried free of all moisture by per-heating. The softening of the plastic is achieved with the use of an oven or hot plates placed adjacent to the press. The moulding pressure used is approximately 3 to 4 tons per square inch.

As has already been stated, cellulose acetate absorbs water readily, and this fact is made use of the wet moulding process. The material is soaked for some hours previous to moulding operations, and the water absorbed serves as a plasticizer. The blanks are then dipped in hot and placed in the mould, or a jet of steam is passed through the bottom half of the mould. Cold water is used to cool the mould before the article is ejected. The water absorbed by the plastic during these processes is completely dried out before the article is ready for use.

Dry moulding is adopted when the articles to be moulded are intricate in design, and the higher working temperature permits easier working of the plastic.

In both processes the moulds used can be made from bronze: steel moulds are not necessary. When the wet moulding procedure is adopted, perfectly satisfactory moulds can be made from hardwood or plastic resin impregnated wood, such as Permalis or Jicwood.

There are many other operations which can be carried out on cellulose acetate. Some of these are pumicing, trapping, polishing and matting; there is not sufficient space available here, however, to give full details of how these operations should be carried out. The reader is advised to communicate with the manufacturers, who, in the experience of the author, are only too pleased to help with advice and suggestions.

There are many applications in electrical appliances where the appearance and insulation protection offered by plastics are required, yet the strength factor offered by such materials is inadequate. Handles for refrigerators, electric ovens, switch boxes, etc., are examples of this class of work. To satisfy the demand for these articles it has become standard practice to cover metal die-castings with a thermo-plastic material such as cellulose acetate.

The process is carried out by placing the cast object in a mould, the contents of which are the same as those of the casting except that the mould is slightly larger. Cellulose acetate is then injected into the mould and covers the surfaces of the casting. It will be understood that the casting cannot be completely covered because some support must be provided during moulding between the external faces of the casting and the contours of the mould. The thickness of the cellulose acetate is usually about .06" to .08".

WORKING WITH POLYSTYRENE

Polystyrene can be cut by circular saw or hand saw, drilled, milled, turned and tapped.

As with other plastics, certain precautions have to be observed against deformation and overheating. A thick section circular saw is better than a thin one, and hard drills with plenty of clearance are required. No attempt should be made to drill deep holes without frequent withdrawal of the drill to release swarf and chips. When drilling and tapping, it should be remembered that polystyrene tends to be brittle. For threads which are to be used very frequently it is better that metal inserts be provided. If screws are over-tightened in polystyrene there is always a danger of stripping the threads and splitting the plastic. When a number of screws are used to hold down a piece, the tightening on each screw should be equal.

PLASTIC CEMENTS AND CEMENTING

Thermo-plastic materials can be joined together quite readily by processes which are similar in some respects to the welding process adopted with metals. Since these materials are plasticized by the application of heat, the use of heat and pressure will combine the two separate parts in a homogeneous single part. A similar weld can be achieved with some thermo-plastics by the use of cements made up from the actual plastic in a solvent. The solvent serves to soften the edges or surfaces of the separate parts, and when evaporation takes place these are completely fused together.

A similar weld is not possible with the thermo-setting materials, however, because, as has been pointed out, once they have been properly processed they are not softened by heat or soluble in any known solvents. When it is desired to stick two or more pieces of a phenolic material together, reliance has to be placed entirely on the adhesive properties and shear strength of the cement.

When sticking thermo-plastic materials with the application of heat it is important to remember that pressure must be applied at the same time as the heat, and

that the latter must only be applied locally. If pressure is not applied both pieces will become a sticky mess as soon as the softening point is reached, and will rapidly lose their original shape. It should also be noted that there is usually a considerable difference in degrees centigrade between the softening point and flow point of the material. A true weld cannot be achieved unless the two pieces are heated locally up to the softening point of the material and held together under pressure. In most cases it is better to rely on the use of a solvent cement. Pressure is still required to ensure a satisfactory joint, but the area of the material to be softened up can be controlled to a closer degree than when heat is used as the softening agent.

For cellulose acetate a suitable cement can be made up with Acetone and Benzene. B.X. Plastics Ltd. recommend the following two alternative solutions: (1) Benzene 200cc.—Acetone 1 gallon, and (2) ½ second viscosity nitro cotton (alcohol wet) 15 grammes, Ethyl Acetate 80 cc. and Acetone 20 cc.

E.E. Halls (in 'Plastics', March, 1951) gives the following three typical cellulose cements: (1) By weight Celluloid (Virgin scrap, high viscosity) 10% with acetone 90%, (2) Celluloid 25%, acetone 75%; and (3) Celluloid 10%, acetone 45%, amyl acetate 45%.

For polystyrene, a solution of polystyrene in Benzene is used, as is obtainable from B. X. Plastics Ltd. This solution, primarily intended as a varnish, has very good adhesive properties.

A very good polystyrene cement is quoted by E.E. Halls ('Plastics', April, 1951), and its composition is given as follows: Polystyrene Resin (150° Polymer) 25%, Coal Tar Benzene 20%; Coal Tar Solvent Naphtha 50% and arochlor 1234 5%.

Jointing of Polyvinyl Chloride can be effected with the use of suitable solvents, together with applied pressure. A liquid polyvinyl-chloride cement is available, known as Linatex P.V.C. solution.

Phenolic sheets and mouldings can be cemented together with Ardux cement. This product has to be stoved at 140° 150°C. It is claimed that in joints made with Ardux cement the adhesive is stronger than the materials joined together.

Small punchings can be held together for general assembly purposes by the use of an air-drying varnish, but it is not wise to place any reliance on the joint when under load.

Urea-pormaldehyde glues such as Beetle Cement are well known in the woodworking industry, and in fact are the only approved glues for use in tropical climates, but this only has a bearing on radio and electrical work in connection with the manufacture of Instrument Cases and Containers.

Classification of Glues According To Their Durability

Nearly all synthetic resin adhesives and very many of the glues of natural origin are marketed as proprietary articles. and of those of any one type, some are better than others. In the summary that follows, every possible care has been taken to avoid generalised conclusions based upon tests only one particular brand, and where the results with many have been available. undue weight has not been given to outstandingly good or bad performances. The warning is given, therefore, that a particular proprietary make may not conform with the average performance of its type.

THE WEATHER-PROOF GROUP

To be classed as Weather-proof, a glue must have shown a high performance under systematic tests, and in service must have proved itself to be extremely resistant to weather influences. This does not mean that the adhesive is entirely proof against destruction, or that no deterioration will occur; such claims for any product that has been available for such a comparatively short time as some of the resin glues would be foolish and misleading. Nevertheless the Weather-proof group can be regarded not only as the most durable of the known adhesive, but as including only those that on the available evidence are likely to survive for a very long time.

Three types of resin adhesives only are classed as Weather-proof, the phenolics, the resorcinols, and (provisionally) the melamines. Not carefully that the last-named is the true melamine-formaldehyde resin, not the urea fortified with a melamine salt, or even the mixtures of urea and melamine resins.

These three resin glues satisfy the highest requirements of B. S. 1203 and 1204, and by the allied ageing tests over periods of three to six years have maintained their high initial qualities. On the data available from other tests (which are admittedly of shorter duration for the melamines and resorcinols than the phenolics), they are extremely durable over a wide range of temperature and moisture content conditions, including exposure to weather and fresh and salt water, repeated cycles of wetting by hot or cold water or damp air followed by drying. At temperatures of the order of 70°C. (158°F.), such cycles produce some degrade, but this is not apparently progressive with time. At 90°-100°C. (194°-212°F.) the joints lose much of their strength over a lengthy period, but it is the wood itself that fails rather than the glue. Although themselves immune from micro-organism attack, these resins do not protect the timber to any extent, but as they will withstand the action of solvents, oils, wood preservatives, and fire-retardant chemicals, they offer no bar to the treatment of the wood.

Where the joints have been properly made, the record of these three adhesive under service conditions has been extremely good, and very few authenticated cases of serious weakening (let alone failure) in aircraft, boats, packaging, or houses have occurred, even under extremes of tropical conditions. On the other hand, the glues have frequently been blamed for failures really attributable to bad workmanship, and it must be realised that these resins require particular care in their use, and are not a little intolerant of mis-handling.

THE WEATHER-RESISTANT GROUP

Adhesives of the Weather-resistant group are defined as having a high degree of resistance to severe exposure, but which will in the long run exhibit deterioration, and thus show themselves unsuitable for the most rigorous conditions. Clearly the time factor is highly important to this definition, and it can be taken as meaning the five to ten years over which systematic observations have been in progress. Deterioration in this case means not a slight fall from the initial state, but noticeable separation of glue lines or a drop in joint strength such as cannot possibly be explained away by anything but the deterioration of the adhesive itself. At the same time, it is an essential that at some level or degree of severity of exposure, that the adhesive should show permanence, for by the definition of an efficient adhesive an adequate bond must be maintained for as long as it required. The difficulty with the Weather-resistant adhesives lies not so much in discovering that they have their weaknesses, but in proving their virtues in the face of prejudices incurred as the result of initial overstatement of their strength.

The adhesives concerned are the polyurethanes, and the normal and fortified urea-formaldehyde resins. The first is of little importance. The normal urea resin is a popular and widely-employed adhesives possessing qualities that endear it to the user, and its performance in practice merits the closest examination so that an assessment can be made of its natural limitations. If used beyond these, trouble will occur for which the glue will be blamed unfairly. By the fortified urea adhesive is meant one that has been improved by the addition of other materials in relatively small quantities, as distinct from the use of urea resin to cheapen a more expensive glue. Whether these additions improve the performance to any real extent must be gauged from the result of service trials.

A survey shows that under laboratory type tests, urea resin adhesives have high resistance to continuous soaking in cold water, and give a moderately good performance under repeated wetting and drying. They deteriorate slowly under normal room conditions, but probably reach a steady value ultimately. Temperatures of the order of 70°C. (158°F.) affect them adversely, especially if accompanied by high humidity. They are durable against mould, but it has been noticed that where plywood has been very severely attacked by wood-destroying fungi, the urea resin has also failed. By contrast, phenolic glue lines have been found intact under these conditions.

Natural durability trials show that plywood fully exposed to weather fails in a few years in England, North America and in the hot damp parts of Australia. In joints of larger section such as laminated beams, they show some signs of deterioration but have not failed in periods of three to five years. Intermediate-sized joints, as in Risborough's ply-clad frames, have also deteriorated when fully exposed to weather. Similar material protected from direct rain and sun but otherwise in contact with the fluctuating temperatures and humidities of the outside air has exhibited no actual degrade, though there are indications that slight weakening has occurred.

Experience from actual service is the best guide of all providing the information is reliable—which is difficult to ensure. The account that follows has been prepared from documentary evidence and reliable hearsay, and although the story is short, it carries very great weight.

As the result of experiences in packaging during the war—particularly in the

Pacific zone—official American circles do not rate urea resins at all highly for durability. They are said to be greatly inferior to phenolic, resorcinol, and melamine types, but definitely superior to casein and similar protein glues, even when these have toxic additions to increase resistance to mould growth.

T.D. Perry in an article defending urea resins makes a useful extract from an official American publication as follows: "No cases are known to this Laboratory where urea resin joints originally well made failed in service because of elevated temperatures." (The temperatures concerned are those in aircraft wings exposed to summer insolation effects). The quotation continues: "and the superiority of urea resin joints over casein joints was demonstrated when an inspection of several hundred glider parts that had been in storage for several months, disclosed that the urea resin joints were generally in good condition, while the casein joints were generally deteriorated."

Reports by experienced technicians from the Royal Aircraft Establishment on the behaviour of wooden aircraft in India throw light on the conditions in that country and on the behaviour of adhesives. Pryor says that he "did not find any sign of deterioration in (urea resin glue layers which haad not been exposed to waater)" He later amplifies this to make it clear that it was not water as such did the damage, but the combination of high insolation temperatures and damp. Grinstead and Leigh say of some aircraft wings inspected after service in the Calcutta area: "In some cases there was evidence to suggest moisture intrusion as a possible cause of failure of the glue: the signs were cracked dope and deteriorated fabric over the top of the butt joint, a poor joint between flap shroud skin and the edgebook". Again note that these failures occurred where high insolation temperatures could build up. As a general summary of the behaviour of adhesive, they say: "It is considered that the performance of urea-formaldehyde glue has been good." Without wishing to deprecate these findings in any way, it must be pointed out that the periods of service involved did not exceed two years at the most.

Risborough has examined exterior flush doors in which urea resin has been used in the plywood and as the means of sticking this to the frame, such doors having been in use for several years. The indication is that the bond on the weather side of the door has deteriorated and in some cases failed, but it is markedly superior on the inside face. In boats of the light naval craft type, both normal ureas and the early forms of fortified urea have weakened and sometimes failed in plywood frames in the bilge zones, but little or no trouble has been found between main deck and floor levels. Of decks, it appears that deterioration has been limited to the first glue line, those further inside the plywood showing excellent adhesion after five years or more. In garden furniture that received little or no protection from weather, urea glue in the joints has been observed to fail completely within four or five years.

Perry writes of the Weather-proof group:

Their use is strongly recommended for furniture, mechanical equipment, and structural members exposed to the weather, It is equally important that they be used in products designed for marine service, for dye houses, tanneries, textile mills, and for tropical climates. Under such conditions no competent authority would normally advocate the use of urea resin adhesives. This is in spite of the fact that radio manufacturers found that

urea resins substantially reduced their unknown exposure hazard over the earlier conventional glues.

Perry has done a great service in championing the urea adhesives, but it is thought that he shows excessive caution in condemning them for tropical use in such an unqualified manner. On the evidence available, the present writer gives his personal opinion of the limiting conditions that should govern the use of urea resin glues if they are to give a satisfactory performance on a long-term basis. They should not be employed:

1. Where the maintenance of a very high proportion of the intial joint strength is essential.

2. Where the edges of the glue lines are fully exposed to direct sun and rain as in natural weathering, or where the adhesive is protected from such effects only by a thin veneer as in plywood.

3. Where temperatures are likely to exceed about 50°C. (120°F.) for periods that in the aggregate will be lengthy if at the same time the moisture content of the wood is of the order of 15 to 20 per cent.

It seems that urea resins do not suffer under continuous water soaking in cold water, nor by occasional wetting and drying. At normal temperatures (say up to about 30°C. or 90°F.) they are not greatly affected by humidities of the order of 90 per cent, and above this the possibilities of rot in the wood itself must be considered, although the adhesive itself immune. If the foregoing is considered in conjunction with the date will be clear that no case can be made against the efficient use of urea glues in tropical countries provided the joints are protected from direct weather influences. As to aircraft, if these were permanently exposed to weather for the periods under consideration for more utilitarian product and if they received as little attention ar maintenance, the use of urea resins i their construction would be unwise in th extreme, but since these circumstances d not obtain, especially with regard t inspection and maintenance, there ar grounds for considering aircraft under the class of protected articles. Aircraft plywood, however, should never be made with urea resins; such thin material receives the full effect of weather very quickly, and is without the protection that it gives to the parts it encloses.

The third member of the Weather-resistant group is the fortified or boilpoofurea, so called because it satisfied the A100 and sometimes the AX100 requirements of B. S. 1203. Early types were developed under the trees of war, and their subsequent behaviour their early promise, for they proved to be but little better than normal ureas. Later types are under test, and are undoubtedly an improvement on the earlier formulations, but they do not earn a place in the Weather-proof group.

THE SEMI-DURABLE GROUP

Of the four types of adhesive in the Semi-durable group, casein and soya are similar in that when wet, they lose a large proportion of their strength—although they regain it on drying. Blood albumin and prolamin glue have high water resistance. All four are liable to attack by moulds and bacteria whilst in the wet state, and this can destroy them completely. It is often contended that this danger is over-rated and the successful use is cited of casein glue in laminated beams and bends in railway platform roofs in Sweden and Switzerland where, although protected from direct rain, the glue is in contact with outside air at all seasons of the year. Many examples found in America of

laminated construction in unheated barns are said to prove the suitability of casein for such purposes. Even from the small-boat world, there are authenticated cases of built-up masts, hollow spare, and even of framing timbers bonded with casein that have given years of excellent service. Before the picketing of aircraft in the open became necessary during World War II, casein was used very largely in their construction and even when the machines operated in tropical areas, trouble was exteremely rare.

On the other hand, it is never disputed that plywood bonded with casein, soya, or blood would very quickly disintegrate if used out of doors or in damp situations. There have been many cases where such material employed for lining or partitioning rooms has delaminated at the bottom edge because of the water absorbed from periodic floor washings. In the American barns, defects have developed at the ends of laminated beams when inadequate ventilation has allowed condensation to be parked out in the English winter during the war years gave much trouble; water trapped in the wings softened the casein glue, ultimately washing it out of the joints, and mould growth was also common. The provision of drainage holes did not eliminate the trouble, as they could never be sufficient in number nor be located so as to function properly.

In this report on the examination of aircraft in India, Pryor speaks of an all-casein glued machine in which the adhesive had failed for about 6 in. forward from the tail end of the fuselage at the bottom due to moisture accumulation, but he adds that "Decay of casein glue is not so common or as severe as it is in England."

It should not be concluded that failure is inevitable if dampness reaches the glue-line. With casein and soya, which then weaken considerably, the glue line will part only if external forces are greater than the residual strength can resist. Moulds and bacteria are comparatively slow in their development, and growth is arrested if temperature and moisture conditions become unfavourable. The addition of a toxic substance to the glue can do much to ward off attack in the early stages, although it will not give permanent protection.

Adhesive of the semi-durable group constitute a bad risk in high humidities or where water is likely to reach joints, and for such applications have been superseded by synthetic resins of the urea type, which are not affected by water at normal or even moderately high temperatures and are immune from micro-organism attack. As to their use in sheltered environments in the tropics, the same verdict can be given; during the wet season (and practicularly in coastal belts) conditions are particularly favourable for mould growth and bacterial action. At other times of the year, casein, soya, or blood would serve admirably, but in places where there is a pronounced and prolonged wet season, their use is not recommended. These three adhesives are tolerant of hot dry conditions, and where these alone obtain are to be preferred to urea resin glues.

THE INTERIOR GROUP

Little explanation is needed of the limitations of the Interior group of adhesives. Animal and starch glues are durable only if damp does not reach the glue line, when they will fail under very light loading. In the presence of actual liquid water, the joints, will float apart. Polyvinyl emulsions have a similar lack of water resistance, and in addition are said to creep under steady load even in the dry state. Whether this is important or not depends on the nature of the joint.

It has been shown that animal and starch glues fail ultimately in a humidity of 80 per cent, that is if the moisture content of the wood exceeds 17 per cent for a lengthy period, and a safe upper limit for their use would be 15 per cent. Coupled with this is the requirement that there should never be even occasional condensation of water, which would not affect adhesive of the semi-durable group. How important is this rider can be demonstrated by leaving a wet glass or vase for a short while on a veneered table in which animal glue has been employed to lay the face veneer.

Interior group glues have been used successfully in dry-tropic regions, but failures have been reported from monsoon areas.

The Bonding of Wood to Other Materials

Like, every other material, wood has its drawbacks and limitations, and equally with the others, it has some outstanding virtues. Thanks to comparatively recent developments in adhesives, it is now possible to combine wood with metals, plastics, etc., for aesthetic and functional purposes, and this has greatly increased the usefulness of each material in turn. It is not only to bond dissimilar substances to timber that such adhesives have been devised, but the bonding of metal to metal and plastic to plastic is now a recognised process. This summary, however, is confined to joints in which wood forms one half of the partnership.

METAL-FACED PLYWOOD

Probably the oldest form of composite is metal-faced plywood, which has been available commercially for many years. To one or both sides of plywood or block-board is bonded a sheet of galvanised iron, aluminium, copper, zinc, stainless steel, or even special metals, as gold and silver. The main function of the metal is to provide a hard-wearing surface impenetrable by moisture.

In the light gauges employed, the metal sheet alone would lack rigidity, but backed by the plywood, it is made remarkably stiff for the overall weight, and is free from drumming. Where it is required to cover large areas with metal-faced plywood, there are various ways of making the joints between adjacent panels which effectively prevent the entry of moisture, and for freely-exposed parts such as doors and moving partitions, the metal can be turned over the wooden core and soldered to make hermetic seals. Among the uses of single and double metal-faced plywood are van bodies and bus roofs, lifts and lift-shafts and similar tunnels that have a high fire-hazard, office and wash-house partitions, heavy-duty tables and counter tops, kitchen furniture and hospital equipment where frequent cleansing is essential, and packaging boxes and crates of the returnable kind. Faced with the nobler metal, "plymetal", as the Americans call it, has high decorative potentialities.

In addition to its use for cladding plywood, metal is sometimes incorporated as one of the internal layers, a special form of which is the scorch-proof table-top. In this a thin foil of aluminium is laid between the main plywood board and the decorative face veneer, and serves to conduct away local heat from cigarette ends that have missed the ashtray. The converse to metal-clad plywood is veneer-faced metal, which has been used for

furniture-making. This construction economises in timber in times of shortage and relieves the purchaser from having to contemplate the drab exterior of all-metal furniture.

At one time, metal-faced plywood was mostly bonded with casein-rubber latex adhesives, and indeed it is believed that they are still widely used. The firms employing them have developed special mixes for particular purposes, and their composition is seldom disclosed. These glues can set in the cold, which has its advantages, for compared with wood, metals have a high thermal expansion and hot pressing not only sets up great internal stresses in the joint but may lead to warping of the finished product—particularly if it is metal-clad on one face only. As an adhesive, casein-latex belongs to the Semi-durable group, and must therefore be protected from weather. This is done effectively on the face of the metal itself, but if moisture seeds round the edges, trouble will ensure.

Hot-setting methods of bonding metal to wood are successfully applied, but as a rule, the wood is in the form of thin veneer or plywood and not in massive pieces, which would certainly be damaged by exposure to air at the temperatures necessary to the process. The use of a thin aluminium foil as a heat-dissipator under a decorative face veneer has been mentioned. Plywood can be so faced by using phenolic film glue as the adhesive, and warping can be reduced by careful control of moisture content and by partially cooling the sheet before removing it from the press.

ASSEMBLY GLUING BETWEEN WOOD AND METAL

Del Monte speaks of a process employing casein-latex that obviates the need for heating the wood as well as metal. The latex mixture is applied to the metal and vulcanised at 140°C. (285°F.). To this priming coat is later applied the cold-setting urea—or phenol based glue—used to bond the metal to the wood. A similar process called "Cordo-bond" is described by Grafton in which the primer (the composition of which is not disclosed) is set on the metal at temperatures between 120° and 150°C. (250° and 300°F.). The warning is given that the primer is not completely thermo-setting, and that the strength of the ultimate bond is somewhat reduced at elevated temperatures. Other American processes have such names as Cycleweld and' Cyclebond, Durite, Metalbond, Pliobond, and Reanite.

In England, the Redux process has been developed for gluing wood to metal and plastic, and also for bonding metal to metal. It has been described by Moss of Messrs. Aero Research Limited, the patentees. The first stage (which is essential to all wood/metal gluing) is the degreasing of the metal surface (by trichlorethylene, for example), followed by sand-blasting or pickling where necessary. Redux liquid is next applied to the metal and a special power sprinkled on. The plywood is coated with the liquid, but not the power, or if veneer only is being bonded, the liquid should be omitted or penetration will result and the outer wood surface may be unsuitable for secondary gluing. The parts are clamped together under a pressure of about 200 psi., and cured at not less than 140°C. (285°F.) in about 15 minutes, but the time can be reduced to 3 minutes if a temperature as high as 185°C. (365°F.) is used. This heating can be applied by putting the parts in an oven, by radiant lamps or by the conventional hot-platen press. It is said that the colour of the squeeze will show the degree of cure; light yellow indicating under-cure, black over-cure, whilst the

perfect joint is a dark reddish-brown. Since the bond is fully water-resistant when properly made, soaking in cold or hot water will serve as another test of quality. Redux is stated to be proof against alcohol, petrol, and other common solvents, and immune from attack by micro-organisms. Whilst there is no evidence that the adhesive as such has any corrosive action on metals, some cases of attack by pickling agents have been noted that adversely affected the joint as a whole.

It should be noted that the Redux process requires high temperature and pressure for its use, and in the wood/metal field is employed chiefly to bond a wood veneer or plywood to the metal, so that the main joint between the two can be made later by a cold-setting wood/wood adhesive. Moss states that a modified form of Redux has been developed to set at 105°C. (220°F.) but even this is inconveniently high for what is usually considered to be assembly work.

THE GLUING OF IMPROVED WOOD

The gluing of improved wood* to itself or to natural wood was extensively carried out during the war for airscrew manufacture. Casein glue and urea and phenolic resins were all successfully employed, and resorcinol adhesives were used on a small scale with entire satisfaction. It was found important to remove from the improved wood surface the high glaze that the manufacturing process imparts, and some makers toothed the mating faces. The purpose of the toothing was not scarification as such, but to break up the continuity of large areas of get glue line occurring in the improved wood itself that were frequently exposed by the planing operation. It was found essential to use a gap-filling adhesive, for the material is not easy to machine, and planer grooves or "clip" at the ends sometimes left slightly out-of-plane surfaces which could not be pressed into contact. A Madison report says that acid or alkali treatment at the surfaces was generally unsatisfactory, and that the use of acetone, benzol, or hot alcohol did not better the gluing qualities of the improved wood. The same report indicates that casein does not produce good joints, but this is not in accord with British experience.

The bonding of wood to materials other than itself is often a matter of experiment, and of all the adhesives, the resorcinol-formaldehyde resins are the most promising for a first attempt. It is recorded that they have, in one form or another, been successful in joining such diverse substances as laminated and moulded phenolic products, nylon, methyl methacrylate sheet, natural and synthetic rubber, asbestos, cork, brick, and concrete.

* Materials prepared from veneers impregnated with resins to a varying degree and compressed and bonded under heat and having a density ranging from 0.7 1.7.

Pulps for Strawboards from Ulla and Panni Grass

Strawboard is largely used for packing in various forms. It is used as such and also in the form of corrugating boards for boxboard and shipping containers. In India the textile industry consumes a large portion of strawboards. The production of straw-boards in this country commenced in 1932 when the first strawboard mill went into production at Saharanpur. Although there are 17 board mills in the country, only 4 are economic units. The production of boards by these mills is very low compared to their rated capacity. In 1949 only 19,585 tons of boards were manufactured although the annual total rated capacity was 45,000 tons. Due to the shortage of fibrous raw materials, the strawboard mills are unable to work to their full capacity and have to remain idle for some months in the year. The domestic annual consumption of strawboards at present is about 50,000 tons and it is expected that this will rise to about 80,000 tons in the next few years with progress in the industry and commerce.

Strawboards are characterized by stiffness, good strength properties, smoothness of surface and adaptability for forming corrugated flutes at high speeds. Wheat and rye straws are very well suited for the production of strawboards. Rice straw, barley straw, bagasse, flax shives and hemp hurds are also used to some extent. In India wheat straw, rice straw, bagasse and some unspecified locally available grasses are used for the manufacture of strawboards. Wheat and rye straws give comparatively a high yield of boards and produce the stiffest boards due to their high hemicellulose contents.

The processes used in Europe for the production of straw pulp are described by Atchison. Generally lime is used in Europe and America for the digestion of the straw in spherical rotary digesters. Lime is also used in the Indian board industry for the cooking of the raw materials. The advantages of using lime for the digestion are described by Aronovsky. The low cost and relative insolubility in water are the outstanding advantages of this chemical. Saturated solutions of lime contain small quantities of this chemical. As the lime is used up in the pulping process, more of the unused material is dissolved. and a saturated solution is thus obtained continually for the pulping of the raw material. Lime thus provides more uniform pulping conditions than other chemicals usually employed for cooking. The disadvantages of lime for the pulping are the difficulties of washing it and its salts from the pulp and the peculiar odour of the manufactured strawboards. The lime salts, when left in the pulps gradually clog the wire and felts of the board machine, resulting in frequent shutdowns and consequent low production. The life of the machine clothing is shortened by frequent washing of the wire and felts with acid solutions. The odour is objectionable when the board is used for packing food stuffs Aronovsky and co-workers studied the effect of lime, caustic soda and sodium sulphite as the pulping agents. They found that a mixture of 2 per cent. lime and 2 per cent. sodium sulphite, based on dry straw, produced an exceptionally free pulp with very good strength properties. When sodium sulphite is used to replace lime in pulping straw for the manufacture of strawboard, the product has considerably less odour than the limecooked material. The pulp produced by the sodium sulphite has better strength and operating properties.

As mentioned earlier, the strawboard mills in India are not able to work to their

full capacity due to shortage of the fibrous raw materials. Wheat and rice straws are required for cattle fodder. Rice straw is also used for tatching. Bagasse is used in the sugar mills as fuel. Hence the board mills do not get enough supplies of these raw materials. To make up the deficiency they use to some extent certain grasses which are locally available. Even the supplies of these grasses are limited. *Ulla* grass (*Themeda arundinacea*) and *panni* grass (*Vitiveria zizanioides*) are available in large quantities in Northern India where two strawboard mills are situated. *Panni* grass is also available in Madhya Pradesh and Bombay. These grasses have no special use and are burnt down every year to prevent fires in forests. Hence an investigation was carried out in this Branch to test the suitability of these grasses for the production of pulps for strawboards.

CHARACTERISTICS AND DISTRIBUTON

Themeda arundinacea, Ridley, belongs to the family Gramineae. It is known as *ulla* grass in some parts of Uttar Pradesh. Board has given a description of this species. It is a tall perennial grass. The culms are 9-18 feet tall, yellow, smooth, polished and elliptic in section. The leaves are long, up to 6 feet and 1 inch in width; the sheaths the compressed and smooth. The grass flowers in October to December. It is common in low lying well drained soils, and grows in the lower Himalayan region from Kumaon eastwards to Assam. It is usually characteristic of sal (*Shorea robusta*, Geartn.,) forest tracts. It is found in large quantities in Uttar Pradesh, and also in Bihar, Orissa, Assam and Naga and Khasi hills. It occurs in Burma and Malaya. The estimated average annual yield of dry grass is 3.5 tons per acre.

Vetiveria zizanioides, Stapf., is a densely tufted perennial grass from a branching root stock with spongy aromatic roots. The culms are stout and up 5 feet tall and are smooth and glabrous, covered by the sheaths which are strongly compressed, especially the lower. The leaves are 1-3 feet long, erect, rigid, firms or somewhat spongy, usually glabrous but sometimes hairy on the upper surface towards the base; the margins are rough. This species is common on heavy soils in the open where it is often gregarious in thick tufts. It is distributed throughout India ascending to an altitude of 4,000 feet. It also grows in Burma. In India it is found in Punjab, Uttar Pradesh, Bengal, Madhya Pradesh, Bombay and Madras. It flowers in July to January. The estimated average annual yield of the dry grass is 2.4 tons per acre.

—INDIAN FOREST BULLETIN NO. 155

Manufacture of Carbon Brushes—II

The graphite-carbon brushes have a large or the greater percentage graphite, the remainder being amorphous carbon. These contain sufficient graphite for lubrication. Artificial as well as natural graphites are used, depending upon the desired characteristics of the finished product. The abrasive qualities will vary with the quality of the original graphite used. They are usually hard with carrying capacities the same as or higher than the "carbon" brushes. The contact drop is low or very low. They find application on industrial motors, moderate speed generators, mining and mill service and railway motors. In their small shapes, some grades are adapted to fan motors and small domestic motors where long life is essential.

There are numerous grades of brush-

es composed entirely of graphite except for the bonding material. These have high carrying capacity, medium contact drop and low coefficient of friction, adapting them to high commutator speeds. A few grades possess low specific gravity to reduce brush inertia at high rotative speeds.

Most brushes of the graphite class are non-abrasive or with a polishing action, or at most but slightly abrasive. They are generally used on undercut mica commutators, but a few of the slightly abrasive grades can be used when conditions are not served on flush commutating surfaces. They possess low mechanical strength and are incapable of meeting severe machanical conditions. This type has much in its favour where quietness of operation is desirable. They are employed to a considerable extent on turbogenerators and other high speed machines, automotive lighting generators, electric vehicle and battery locomotive motors, battery charging and other low voltage generators and similar machines.

For the electrographic brush, in the final baking, temperatures are regulated as well as time of exposure, so as to graphitize all or part of the amorphous carbon. When entirely graphitized, the brush is non-abrasive. They are hard and in some grades very hard, and mechanically strong and tough, with high conductivity. Their commutating properties are above average, with very high contact drop, combined with low coefficient of friction and high carrying capacity.

Brush manufacturers standardize their sizes to a limited number of dimensions to eliminate the cost of preparing and keeping in stock the thousands of sizes formerly employed, when everyone who designed an electrical machine seemingly thought it incumbent upon him to design a new or a special sized brush. The lengths of round and rectangular brushes up to and including 1¼ in. increase by ⅛ in. steps, then by ¼ in. steps to 3 in. length, then by ½ in. steps above. The widths increase by 1/16 in. steps up to ¼ in. then by ⅛ in. steps to 2½ in. width or diameter, and by ¼ in. steps above that, preference being given to ¼ in. steps wherever possible. Round brushes vary by ⅛ in. steps of diameter. Thicknesses increase by 1/16 in. steps up to ¾ in., and then by ⅛ in. additions. Bevels vary by five degree additions. The length of a beveled brush will be that of the square ended brush from which it was made.

Brushes are essential parts of an electrical machine. The design of the machine must be taken into account in selecting the type of brush to be used. The mechanical features of the brush are controlled by the type of brush holders. Brushes may run radially, leading or trailing in respect to the commutator rotation. They may have flat or beveled tops and "hammer plates", lifting clips, or other attachments. Brushes may or may not have flexible shunts (formerly known as "pigtails"). The design may provide for spring pressure to be adjusted as the brushes wear, and determines the number and size of brushes.

In "double-brush" holders, two brushes are used in place of one. Each may have a separate spring. The two may be parallel or they may run with one leading and one trailing. Double brushes generally function better than a single brush; they offer the advantages of a greater number of smaller brushes, improve commutation, and maintain better contact with the commutator.

The "Multiflex" brush is the conventional brush cut in two through its thickness with a corrugated hammer plate attached to one of the two sections and can be used in the standard brush solders.

Brushes are set at an angle with relation to the commutator other than the radial or 90° position. They run either 'leading' or 'trailing' as regards direction of rotation. On a ring or commutator a leading brush has its 'toe' pointed against rotation, while a trailing brush has its 'toe' pointed in the direction of rotation. A radial brush is indicated in the central sketch.

Experience indicates that leading brushes generally give the best results on machines that run in one direction only (as is usual for generators). Reversing machines usually have radial or trailing brushes. A rather steep angle of about 30° has generally been found for leading brushes, but trailing brushes should not be at an angle of more than 10 or 15° from the radial. The functional drag causes trailing brushes to wedge and chatter if the angle be too great.

It is common practice to level the top of the brush as well as the commutator end. This makes it a reaction type brush wherein the reaction of the spring pressure on the bottom tends to hold the long face of the brush against the brush holder. So effective is this reaction that some holders consist of only a plate, against which the long face of the brush rides, and the necessary spring mechanisms.

In the "double-brush" holder of the General Electric type, practice runs the leading brush at 30 and the trailing one at 10° for unidirectional machines. The leading and trailing brushes are both run at 20° for reversing motors. These conditions represent a compromise.

There is no uniformity of design of top bevel. Leading or trailing brushes are sometimes run with top bevels of 5 to 35° or with none. Experience with the so-called Bayliss type brushes bevel is required to hold the top of the seems to indicate that a fairly large top brush with a long face against the holder, so that there will be no chattering or rocking. However, certain mathematical calculations point toward a leading brush with no top bevel and a 25° bottom bevel as best for unidirectional machines. It is customary to measure the angle between the axis of the brush and the projection of a radius of the commutator, or, expressed in another way, the brush angle is the angle "cut off" in machining the brush.

Unusual local conditions such as contaminated atmosphere, abnormally heavy or abnormally light loads, can exert a great influence on the brush operation with the result that the standard grade may not do well and thus influence the operator to change the grade of brush. It is not uncommon for the grade of brush to be blamed when the true cause of the trouble is a loose compensating connection, an improperly connected field, a poorly undercut commutator, an eccentric commutator, mechanical unbalance or some other defect in erection or assembly.

Since many modern machines have compensating windings or interpoles, it is well to check the compensation if trouble occurs, particularly where it shows up as poor commutation. This is done by taking a "field form curve" or a "brush drop curve." The former

as a bar-to-bar voltage curve with the voltage plotted as a function of position as regards fields and brushes. The latter is a curve of voltage drop taken across the thickness of the brush with one side of the low reading voltmeter connected at the brush shunt and the other in contact with the commutator at the various points. Carbon sticks or 'lead' pencils may be used for contacting the commutator.

Such curves are useful in checking the brush position also. A typical set of these curves, run on a 4,000 kw. 600 volt 214 r.p.m. rotary converter, with brushes in various positions; so the brushes were shifted in steps against rotation of ½, ½ and ¼ bar-widths. Each step showed improved curves until the final or curve was reached. This is considered a satisfactory curve for operation.

In the realm of industrial machines at standard voltages of 100 to 500, the following types of brushes are usually used:

1. Medium and high speed heavy duty D.C. motors or generators with undercut mica-non-abrasive, high or very contact drop electrographite grades.

2. Similar machines subjected to heavy periodic overloads or corrosive atmospheres-brushes as in class one but with "cleaning" or "polishing" brushes distributed over the commutator length. Such "cleaning" brushes are generally of the high resistance natural graphite class and of medium to heavy abrasive action.

3. Similar machines that run for prolonged periods at very light loads and with some exposure to fire, wood pulp or chemical fumes (as commonly encountered in paper mills)—high resistance graphite brushes with moderate polishing action.

4. Cranes and hoists—moderately "polishing" carbon-graphite or electrographite grades.

5. Heavy duty mill motors—electrographitic brushes of very high contact drop or relatively non-polishing carbon-graphite brushes.

6. Turbo-generators with steel field rings—natural graphite brushes with moderate polishing action and low specific gravity.

7. Slip-ring induction motors natural graphite brushes with moderate polishing action which may be of high specific gravity, or metal graphite brushes of varying metal content. The choice depends on the current density in the brush of the machine in question.

8. Rotary converters, slip ring or A.C. end—non-alloy metal graphite brushes (or those alloyed but lightly) on more recent higher speed machines, and alloy brushes on the older lower speed machines; commutator or D.C. end—the highest drop electrographite brushes with "cleaning" brushes added if necessary.

9. Small D.C. motors and generators electrographitic brushes with slight polishing action or high resistance graphite grades.

10. Repulsion-induction motors—various types have widely different characteristics and require different brushes.

11. Universal motors—high resistance electrographitic or natural graphite brushes usually with some cleaning action.

12. Plating generator, 6 volts—high metal contact brushes of the alloy or non-alloy type with 85 per cent or more of metal.

13. Plating generators, voltage above 6—metal graphite brushes with lower metal content of 65 to 75 per cent.

AGRICULTURAL TIPS

SOIL FOR A GARDEN

A good soil for a garden should present the following characteristics. It should be at least two feet deep, small stones to the extent of not less than 10 per cent or more than 20 per cent. should occur, mixed with the fine portion of the soil.

The particles composing the fine portion of the soil should be in such a minute state of division that when moistened and pressed in the hand, the points of the fingers should not feel gritty matter: such a soil is called a loam. In an air-dry state it may consist of:—

Small stones	15	per cent. nearly.
Fine sand	50	,, ,, ,,
Clay and oxide of iron	10	,, ,, ,,
Lime stone	5	,, ,, ,,
Organic matter and water	15	,, ,, ,,

Potash, Soda, Magnesia, Chlorine, Carbonic acid, Sulphuric acid, Phosphoric acid, Nitric acid—each in proportion near to ½ per cent.

Traces of a few unimportant bodies.

If the particles of sand are slightly larger than in our typical loamy soil, the cohesion will be much less and the soil may be described as sandy, and an addition of as little as 3 per cent of clay, with a corresponding reduction of the small stones will effect the tenacity of a soil so much that it would be described as a stiff, retentive clay.

THE VALUE OF IRRIGATION

Agricultural progress of India depends materially upon her irrigational system. But the importance of it is not fully appreciated in the country. It is only recently that have been new schemes are introduced in India with adequate irrigation facilities, Bengal could feed the whole of India. If the existing rice-fields of Bengal gave a yield per acre as high as those in Spain, they would suffice for this purpose. If they yielded as well as the rice-fields of Japan they would feed 200 millions of people. And what is true of Bengal holds good in the case of other provinces as well. The forms of irrigation most urgently required are non-perennial canals and tanks and ponds but the whole matter requires the most careful investigation. "Any country", says Sir William Will cocks, "which possesses rivers and streams whose waters are in flood for six weeks per annum at a suitable season of the year can betake itself to basin irrigation with more or less profit. The science of dams, weirs and regulators has received such development during recent years that there can be no probem so difficult that it cannot be solved by experience and originality. Basin irrigation allows of the thorough development of countries that have streams with short and turbid floods which precede a fairly cool season: whether such irrigation be the stately irrigation of the Nile Valley perfected by the science and experience of 7,000 years or the less perfect but still highly effective and river-fed tank system of Madras; of the primitive but effective basins of Bundelkhand, where impounded water irrigates the crops on the down-stream sides of the basins for one season and then allows of the basins themselves being dried and cultivated in the next". The above words apply with special force to Bengal, where the rivers are all in flood at a suitable time of the year, preceding a fairly cool season.

CULTIVATION OPERATIONS IN JUNE

June is a busy month for the cultivators. They are in great concern when the monsoon has set in and made it possible to sow Aman Paddy and to commence transplantation under favourable conditions. This is the most important of the Indian cereals and no opportunity to ensure a successful crop should be lost at the beinning of the season, says the Indian Scientific Agriculturist.

Single seedling transplantation is the usual recommendation. Weeding of Aus-paddy, Aman seed bed, Arhar and Jute should not be neglected. Sowing maize may be continued in succession. Sowing of Dhaincha for the green manuring of the Rabi crops should not be delayed any longer; 5 seers of seed will be required per acre. This is also the time to sow black variety of Moog and Kalai in Bengal; seed rate is 5 seers per acre. While Til may be sown in June, and will mature in November with a seed rate of 2 seers per acre. It is specially recommended for dirty plots as it is a thick growing crop that helps in smothering weeds.

Harvesting and marketing of summer vegetables is an important work for gardeners and any neglect in properly dealing with the stock will cause loss as they quickly perish. Plantation of pan and supari may be commenced by the end of June. Sowing of chillies in seed bed may also be started.

Summer flowers such as Zinnias, Balams, Marigolds, Amaranthas, Sunflowers, Tornia and the like may be sown during this time. But the seeds should be protected by a shade till germinated and established.

Sowing of peas, beans, cabbage, tomatoes and asparagus may take place. The earthing and thinning of vegetables planted in May require care and attention. Mangoes may be sown for stock during June.

There are two seasons for lac, viz., June and November. June inoculation is preferred in places where rainfall is low. Important localities for lac cultivation are Chattisgarh, Singhbhum, Manbhoom, Mayurbhanj, Orissa Division, Saran and parts of the Deccan, Murshidabad, Midnapur and Rajshahi. Kusum, palas, ber, pepul, banian, gulur, rahar and babul are some of the trees on which lac is propagated. To secure the best results the trees should be well cultivated and maintained in a fit condition to supply green and succulent branches and leaves for the insects to feed on.

People of Nagpur will have the opportunity of seeing "Mrig Bahar" the monsoon blossom of oranges in the 2nd or 3rd week of June. To ensure best results from this blossom, watering should be exposed by digging a pit 5 to 6 feet in diameter and 6 to 9 inches in depth. The small fibrous roots near the main trunk should be cut off. After exposure for a month, the fertiliser to be applied may be mixed with the dry earth that was taken away from the pits and filled in again with the same. The land should then be ploughed. If the rains are very late, proper irrigation will be undertaken.

Scientific Researches and Inventions

NEW CONTINUOUS-DYEING PROCESS

A new continuous-dyeing process which, it is claimed, will revolutionize an industry has been developed by a Coventry firm, and was demonstrated in London recently.

Mr. Leslie Clarke, managing director of the firm which has introduced the now "Franklin-Turkhead ribbon" process. Costs are expected to fall by an initial 10 per cent, according to Mr. Clarke, and the highest degree of colour-fastness has been obtained. Turkhead ribbon, dyed by the new process, remained fast and crisp after the most severe boiling and bleaching tests, which caused ordinary shop ribbons to fade and wilt.

It is claimed that the new process maintains with ease an unprecedented accuracy of shade over very large production and enables vat and azonic dyes—which cannot be employed in traditional dyeing processes— to be used. In one test, 72,000 yds. were maintained dead on shade after a running period of 21 hours. Rigorous treatment in subsequent fastness tests is said not to have altered this shade accuracy.

FIBERFRAX A NEW SYNTHETIC FIBRE

"Fiberfrax".—A new Synthetic fibre developed by Carborundum Co., New York, is expected to solve many research and defence problems. At present it is finding application as high-temperature insulation in combustion and exhaust systems of jet engines. The material resists temperatures that melt cast iron yet its fineness is such that it can be used as a superfilter, or a base for new types of insulation, and fire proof and electrical papers. It is claimed that the fibre can replace or can be combined with asbestos in many electrical and thermal uses. It can be bonded into insulating panels that will not only resist fire and prevent heat loss but will also deaden sound.

Its inertness makes possible cleaning and re-use of the material without loss of filtering efficiency. Studies on potential uses indicate that the material may be suitable for heavy-duty brake linings, as a strengthening component in formed plastic laminates, in high temperature gasketing, for vibration dampening, and as a flame filter to remove ash in gas turbines. In many applications, its light weight (2 lb./cu. ft.) will prove especially advantageous.

The fibre is made by melting aluminium oxide and sand at 3,300°F. in an electric furnace, then subjecting a stream of the molten material to a controlled blast of air. The molten material is biown into a flugy mass made up of random arrangements of extremely fine fibres. The fibres ranges up to 3 in. in length and have an average thickness of about one-twentyfifth that of a human hair. Although it is produced and collected in a buffy mass, the fibre can be processed into felted blankets, firmly bonded batts, tape and paper-like forms (Chem. Age, 67, 1952, 215).

VITAMIN B12 FROM SEAWEED

Seaweed is the first plant material which promises to be a new source of vitamin B12 normally obtained from liver. The vitamin is reported to occur in seaweed in about half the concentration in which it is present in liver.* Surveys of the world's seaweed resources so far carried out have proved the existance of at least 100,000,000 tons. (Chem. Inductr., No. 33, 1952, 810).

PHOSPHORESCENCE OF PROTEINS

The Blue Phosphorescence emitted by proteins under ultraviolet irradiation at low temperature has been investigated. The following proteins were examined:

Bovine serum albumin, egg albumin, gelatin, human-globulin, zein, human fibrinogen, silk fibroin and keratin (human nail). Material containing protein such as bacteria (Escherichia Coli), commercial yeast, "Witte" peptone, agar and dehydrated beef muscle show the same phosphorescent properties as the individual proteins. The emission was observed with solid proteins, with suspension, and with solutions.

In order to find out which of the groups in the proteins are active, 18 amino acids were investigated. Of these only tyrosine, tryptophane and phenylalamine gave indications of characteristic emissions. The remaining 15, including histidine, showed weak blue emissions charactristic of those from tyrosine and trytophane. As little as 19⁹ g. of tyrosine gives a discernible blue phosphorescence. The phosphorescence of tyrosine is brilliant and deep blue; it has a lifetime of about 3 sec. at all pH values. The emission of phenylalamine appears to be bluishwhite, but its lifetime is much shorter, probably less than O. 1 sec.

The exponential-decay phosphorescence of proteins can be attributed to tyrosine, tryptophane, and possibly to phenylalamine. Since the emission is not sensitive to temperature change, it appears to be an electronic transition. A protein phosphorescence of very long duration has been observed along with the exponential decay phosphorescence, but the mechanism is quite different. The long-lifetime emission is highly sensitive to temperature, and proceeds so rapidly, even at the dry ice temperature, that it is not observed.

The long-lifetime phosphorescence can be attributed to certain forms of the aromatic amino acids. Phenylalamine does not have a longlifetime emission; tryptophane has it in natural and alkaline media, and tyrosine only in alkaline media.

Most proteins take up oxygen when irradiated with light from mercury vapour lamp tyrosine and tryptophane absorbing it at a rapid rate. Gelatine (which contains little tyrosine and no tryptophane and whose phosphorescence is much weaker than that of most other proteins) and most amino acids do not absorb oxygen. It is surmised that the intermediates in phosphorescence play a large part in the photo-oxidation of proteins and in their photodenaturation, and tyrosine and tryptophane are the main contributors to protein phosphorescence, both of the exponential and of the long-lifetime type (Science, 116 (1952), 143).

CELLULOSE FROM BANANA STALKS

Cellulose can be extracted from banana stalks economically by the polpex process which does not need high temperature and pressure, but effects considerable saving in sulphite or caustic soda. The machinery required for the process is simple and cellulose derived from banana plant is identical to that obtained from Musa Textiles a plant recognised as a useful source of industrial cellulose. The average yield of cellulose from banana stalks is about 10 per cent on the weight of green material. (Chem. Age, 67 (1952), 297).

Engineering Notes

Manufacturers and Suppliers are invited to give notice in this paper of new products or developments. Description should be brief and blocks or stereos not more than 2½" wide, 85 screen for halftones.

THE "J-H" BUTT SEAM PIECE-END SEWING MACHINE

When textile pieces are sewn together end-to-end for continuous runs in processing, it is desirable that the joint should offer as little resistance as possible to passage through the various finishing machines. The ideal is a joint in which the ends of the pieces just butt together without overlap, so that only one thickness of fabric is presented, and calender bowls, etc., are protected from damage. This requires a special type of sewing machine which trims the ends of both pieces so that a close non-overlapping seam is possible. The stitch is a special chain stitch which is easily removed after processing the material.

Machines for making such a joint have in many cases been imported into this country, but it is especially interesting to note that Messrs. N.W. Harrap Ltd., Kayley Mill, Holland Street, Manchester 10, England, recently introduced their new "J=H" butt seam sewing machine.

Materials of average weight, e. g., cottons, silks, rayons, fine worsteds, etc., can be sewn with this model, and the machine works at high speed. All parts are constructed of high quality materials to ensure long wearing if the machine is regularly lubricated by a few drops of oil each day. As the two ends are fed together into the machine, a pair of small fast running shear blades first trims the edges of the material, and the machine immediately sews them together with the special stitch in a straight seam without overlapping at the joint. The stitch is strong enough to withstand any normal pull from handling in a continuous run, yet can be readily ripped out afterwards.

As will be observed the working head is mounted at convenient height upon a compact robust stand which also houses a complete motorized unit, with the electric motor to suit user's supply. Starting and stopeding of the machine is controlled by a foot switch secured to the sturdy chassis, and rubber wheels and a handle are provided for moving from place to place: the wheels are arranged to ensure that the machine always stands firm on an uneven floor. Where transportability is not required, a fixed motorized stand can be provided.

The "J-H" butt seam sewing machine in its present form is intended for materials of average weight and is suitable for silks, rayons, cottons, fine worsteds, gabardines, etc. For heavier materials N.W. Harrap Ltd. still supply their well-known "Supreme" machines, and for very heavy materials their "Superstrong" machines which are the ordinary piece-end type, without the butt-steam trimming feature.

NEW ELEVATOR CROP LOADER

A machine which, it is claimed, will be of great service to farmers is the new Elevator Crop Loader which has been

specially designed for dealing with large quantities of green crops of all kinds. The machine is of the endless-conveyor type and is stated to be extermely smooth-runnning, in addition to possessing great strength and rigidity.

The loader has an all-welded chassis and frame contruction, and is mounted on and driven from the pneumatic-tyred road wheels. The pick-up drum tines pass through a stripper device, which thus prevents clogging, the tines being fitted close together—a useful feature when loading short crops. A slipping overload clutch is fitted in the main drive to the conveyor, and the delivery chute and the elevator top are shielded in order to form a protection of the crop from the wind.

UNBREAKABLE PLASTIC BOWLS

Unbreakable plastic bowls and decorative trays, marketed under the trade-name Bex Made of polythene, the bowls can be squeezed into any shape and even stamped on without breaking and can be restored subsequently to their normal appearance without any trouble, it is claimed.

Resilient, odourless, unaffected by foodstuffs and domestic chemical, easy to clean, the bowls will withstand boiling water. They are practically indestructible under normal usage. They can be supplied in natural, blue or green colours. The trays, it is claimed, mark a great step forward in moulding technique. Full-colour lithographs are introduced into the moulding process and become part of the tray itself, not merely on the surface. These trays have an exceptional resistance to scratching and general wear.

BOAT MADE FROM MOULDED MAT OF SPUN GLASS

An outstanding example of the unusual materials currently being used in the construction of small craft is the "Allday" dinghy, which is made from Fiberglass. The hull of the craft is moulded in one piece from a mat of spun-glass fibres which, singly, are much finer than a human hair. In a test to demonstrate the strength of this material after moulding, a sample was struck with a 6½ lb. weight, which bounded off without causing any damage, although it was sufficient to split into two pieces of mahogany nearly five times as thick.

To give the dinghy a natural buoyancy, "Onazate" expanded ebonite is built into the ends of the transomes. A cubic foot of this material weighs only 4 lb., and it has the advantage of a completely cellular structure so that even if hole is driven through, its buoyancy is maintained. On account of the non-absorbing character of the material from which the glass dinghy is made, the craft can be subjected to intensive tropical conditions and continuous exposure in all types weather without changing form or increasing its weight. The 75 lb. dinghy has a handling device which enables it to be carried by one person.

LIGHTEST HEARING AID

Lightest hearing aid yet to appear on the U.S. market has been developed by Sonotone Corporation, of Elmsford, N.Y. It weighs only 3 ozs., which is one quarter lighter than any made before by the company, and is twice as powerful as earlier models. Key to the device is the ubiquitous transistor which also increases the life of a conventional hearing aid battery from one month to six months.

O. E. E. C.'S REPORT

In the course of its third report the Oil Committee of the O.E.E.C. states that there has been an unprecedented growth in the volume of petroleum products moving through the Suez Canal from north to south, following loss of the refineries at Abadan to the Anglo-Iranian Oil Company last year. During the year 1952 nearly 4m tons of European refined products passed through the Suez Canal. It is said that the year saw an exceptional expansion of Europe's oil industry and her demands for oil products too rose appreciably. The member countries' crude oil output by 1954 is estimated at 94m tons against an estimated demand for 78.64m tons. The surplus meant for export to non-European countries, will consist of petrol and fuel oil. The Committee doubts if the traffic, above referred to might continue after the completion of the new refineries contemplated to be set up in Aden, India and Australia.

INDO-PAK TRADE

The news that the Indo-Pakistan Trade Agreement due to expire on the 30th June has been extended upto the end of September, will be welcomed by many. Those interested in improving trade relations between the two countries hope that this may prove to be a prelude to the restoration of normal trade between them. As a result of restricted trade, Pakistan appears to have suffered more than India. According to recent reports, West Pakistan's exports to India have declined from Rs. [illegible] crores in 1951-52 to a mere Rs. 53.52 lakh in 1952-53. Exports from India [illegible] only from Rs. 16.14 crores in 1951-52 to Rs. 11.13 crores in 1952-53. Exports from East Pakistan declined from Rs. 76.96 crores in 1951-52 to Rs. 21.23 crores in 1952-53, the sharp fall in the price of raw jute being the main cause. Exports from India to East Pakistan registered but a slight reduction, comparatively speaking,—from Rs. 26.26 crores to Rs. 17.44 crores during this period. There is no doubt left in anybody's mind as to the inter-dependence of the economies of the two countries and unless they choose to run counter to the decrees of nature, they should spare no efforts to widen sufficiently the scope and sphere of the trade between them.

PAK MINERALS

Pakistan does not produce all the minerals she needs for her internal consumption. Yet the fact seems encouraging that the output of some of the minerals available within the country has been registering a steady rise for the past few years. According to official figures the production of motor spirit rose from 2,212,000 during the last nine months of 1948 to 15,101,000 gallons in 1952. The output of coal rose from 241,000 tons in 1948 to 599,000 tons last year. The production of chromite stood at 15,000 tons in 1948. It rose to 17,500 tons in 1951, but went down slightly to 17,230 tons in 1952. In 1948 Pakistan produced 346,900 tons of limestone. Last year the output rose to 672,400 tons. The production of gypsum went up from 14,150 tons in 1949 to 28,830 tons in 1952. Crude petroleum production has registered a three-fold increase, from 17,022,000 gallons in 1948 to 55,430,000 gallons in 1952.

PAK JUTE

The Government of East Bengal is expected to publish its forecast relating to

raw jute production by the middle of July. Reports from Dacca indicate that during 1953-54, East Bengal will produce only about 4 million bales at the maximum. Along with the last season's carry-over of 2m bales, the expected output will not exceed 6m bales, as against 11m bales estimated for 1952-53. The cultivation of raw jute being a precarious occupation owing to a big fall in prices and demand, quite a number of East Bengal's jute growers have switched over from jute to paddy growing and the Government too have made it a point to exercise strict control from the beginning of the sowing season over the licensed area for jute. Also in India the price of raw jute has decreased considerably and there has been a substantial reduction in jute acreage in Assam, West Bengal, Bihar and other jute growing parts. The next season's output, as estimate' by Dr. Punjabrao Deshmukh, the Union Minister of Agriculture, is expected to be about 4m bales, as against 4.67m bales in 1952-53.

TRADE WITH CHINA

In the course of a recent article appearing in a B.I.S. publication, Mr. Percy Arnold says that the first principle Governing the question of trade with China is that it would be wrong to cut off all trade with China and thus by making China uniquely dependent upon Russia and its satellites, drive Russia and China into each other's arms. The other principle is that it is wrong to send strategic materials to China which directly assist it in making war on the United Nations.

Dilating on the role of Britain, Mr. Arnold writes as follows:—

Britain, in fact, controlled the sale of arms to Chnia long before the outbreak of the Korean war. After its outbreak a wide range of strategic goods was embargoed as well. Controls were intensified progressively and since the United Nations embargo on strategic materials in May 1951 no items of significant strategic importance have been expected to China from the United Kingdom or its Colonies. The main effect of the resolution was, indeed, to bring other countries into line with Britain.

"The British list has been published and falls under six main groups:—

(1) arms and ammunition; (2) electric and electronic equipment; (3) a range of machinery and equipment, such as cranes, ball bearings, diamond tools, flexible metal tubing, etc.; (4) certain metals, iron and steel, lead, tin, mercury, etc.; (5) oils, rubber, and certain chemicals; and (6) land water transport equipment of strategic importance.

What is or is not a strategic material has sometimes been hotly debated. An example is the case of antibiotics like penicillin and streptomycin. Some of these are essential for the maintenance of large military forces, but all are valuable for the relief of disease and suffering among civilians. British policy since August, 1951, has been that exports to China shall be limited to normal civilian requirements. Some Western European countries have been exporting unlimited quantities of these drugs but their Governments have now imposed restrictions similar to Britain's. Thus there is agreement among the Governments of the countries of the free world on this point.

POST OFFICE SAVINGS BANK ACCOUNTS

With a view to facilitating easy withdrawal of funds from savings accounts, the Government has now proposed to introduce, as in commercial banks, the cheque system. Crediting cheques, drafts, etc., to offices of savings bank account is also proposed. If the system is to succeed, there is need to open, as in banks more than one counter for receipt of cash and a separate counter for payment of cash.

Among other facilities contemplated by the Government is the provision for extending the number of withdrawals from an ordinary savings bank account to two per week, as against one at present, subject to a maximum of Rs. 1,000. If the depositor's signature does not tally with his specimen signature, attestation of the signature by a gazetted officer or another depositor on an application for withdrawal is necessary. In order to avoid waiting in queues at the post office counters, metal tokens will be issued to depositors at head offices in Bombay, Calcutta, Kanpur and Ahmedabad. Another facility relates to the interest of post office savings bank accounts standing in the names of joint depositors at 2 per cent. per annum, upto a balance of Rs. 20,000 and at 1½ per cent. per annum on the remainder of the balance not exceeding Rs. 30,000. Liberal savings bank facilities are also being provided in post offices in rural areas. The number of branch post offices doing savings bank work as at 31st March, 1953 was 5,076 as against 4,501 a year before. Although this number is too small for a country of the size of India with about five and a half lakhs of villages, the rising trend, in a way, is an indication of the growing popularity of post Office savings banks accounts.

EMPLOYEES' PROVIDENT FUND SCHEME

The Government of India has decided to liberalise the terms of exemption under the Employees' Provident Fund Scheme and allow a further chance to factories that have not applied so far for exemptions. First, not only factories that have provident funds but also such other factories as would like to institute their own funds and run them in accordance with the scheme can apply for exemption. Secondly, non-recognition of a provident fund by the income-tax authorities so far need not stand in the way to any applicant factory. It is proposed to secure centrally recognition of the income-tax authorities for the provident funds in all exempted factories. Thirdly, even if a factory has had provident fund for a section of its employees, it can apply for exemption after framing rules for the remaining sections of its employees. The basic condition for application is that the factory should revise its own scheme or form a fresh scheme in accordance with the statutory scheme. The rules should be fromed or revised before making the application. These relaxations involve certain modifications in the Act and the Scheme. Steps are being taken to effect these modifications. The time-limit for the fresh applications has been fixed as 15th April, 1953. This limit does not apply to infant factories or factories which have yet to come under the scheme otherwise. To avoid any hardships in individual difficult cases, however, the Regional Provident Fund Commissioner is being authorised to allow, at his discretion, some further reasonable time.

HANDLOOM INDUSTRY IN U. P.

Inaugurating the first meeting of the newly constituted U. P. Handloom Board held at Lucknow Mr. Govind Vallabh Pant, Chief Minister of Uttar Pradesh, stressed the need for expanding the handloom industry both for the solution of the unemployment problem and for ensuring production of cloth suited to varying tastes. He also advised the Board to chalk out a scheme by which the industry could ultimately stand on its own feet irrespective of the consideration of competition with mills. In this connection he suggested the following:

"The Government of India's decision to reduce the production of dhotis by mills by 40 per cent. may not yield appreciable advantage to the handloom industry, as I am told that production of dhotis through handlooms is not much. They are employed largely in the production of other varieties of cloth markin, sheets, table covers, etc., and, therefore, what is necessary is that they should have a scheme for the improvement and development mainly of the varieties produced generally by hte handloom industry. The greatest need is that they should have a plan under which the handloom industry could stand on its own feet, unaffected by the rise or fall of prices of mill-made cloth. To this end, I suggest a strong research section, which could find out better designs and methods of printing, etc., and also improve handlooms and other implements. The mills can produce only set varieties, but handloom industry is capable of producing varieties suited to different tastes. Mills cannot compete with handlooms in that matter. I feel that, if they can improve handloom production, the industry can be developed appreciably, in spite of competition with mills. I advocate formation of weavers' co-operatives, which can greately help in the expansion of the industry on right lines.'

DEVELOPMENT COUNCILS

Two Development Councils for the heavy chemicals (acids and fertilisers) and the internal combustion engines and power-driven pumps industries, respectively, have been set up by the Government of India. The constitution of these Councils is in accordance with the Industries (Development and Regulation) Act, 1951, due representation being given to all the interests, namely, industrialists, labour, consumers and technical experts. As recommended by the Central Advisory Council for Industries at the meeting held in May last, the Development Councils have, for the present, been assigned seven functions and these are: (1) recommending targets for production, co-ordinating production programmes and reviewing progress from time to time; (2) suggesting forms of efficiency, with a view to eliminating waste, obtaining maximum production, improving quality and reducing costs; (3) recommending measures for securing fuller utilisation of installed capacity and for improving the working of the indusery, particularly of the less efficient units; (4) promiting arrangements for better marketing and helping in the devising of a system of distribution and sale of the produce of the industry which would be satisactfory to the consumer; (5) promoting standardisation of products; (6) promoting or undertaking the collection and formulation of statistics; and (7) promoting the adoption of measures for increasing the productivity of labour, including measures for securing safer and better working conditions and the provision and improvement of amenities and incentives for workers.

TEXTILE INDUSTRY IN SAURASHTRA

Mr. Shantilal Mangaldas, President of the Saurashtra Millowners Association, addressing the annual general meeting of the Association, called for a joint effort by the industrialists, the workers and the Government to remove the present economic difficulties facing the textile industry in the State and place it on a strong footing.

The only way of stabilizing the industry, he said was to reduce the cost of production. "This can be done by an economy drive and systematic rationalization of labour on the part of the management, by workers paying greater attention to their duties and by the Government assisting both sides in resolving their disputes amicably."

Among the disadvantages of the Saurashtra mills, he said, were the higher freight on cotton, cloth, coal and stores and lower realization on cloth because of the absence of a spot market as in Ahmedabad and Bombay.

The other problems facing the industry were the rise of 75% in the salary bill because of the increased basic wages since 1919, increased dearness allowance, provident fund, etc. The rise was over 300% since 1939. In these circumstances, the textile industry of the State had lost its competitive capcity visa-vis other centres like Ahmedabad and Bombay.

EXPORT TRADE OF CLOTH

The question of export duty on cloth figured prominently in the speech of Mr. Naranji C. Kara, President of the All-India Exporters' Association at the tenth annual meeting of the Association. He said that "on no grounds should cloth or any article meant for export be burdened or shackled with all kinds of imports, such as export duty, cess and sales tax". This is too sweeping a statement to commend itself even to Mr. Kara's own colleagues, for there are occasions when an export duty has to be levied to protect the internal economy against external inflation. An export duty on cloth, for instance is perfectly justifiable when the export trade in this commodity is booming and the sellers' market is strong. But it has to be promptly reduced or abolished according to the trend of world trade in textiles. The Government, of course, reduced the duty ere now, but it was too slow in doing so; and even when it reduced the duty it did not cut it down sufficiently. As for the sales tax, the Constitution does not permit the levy of this tax on exports. So, there Mr. Kara was perfectly right. Mr. Kara was also right when he suggested that the Government should give a rebate of the import duty on raw materials used in manufacturing cloth meant for export, as otherwise, it would place the Indian mills at a disadvantage vis-a-vis its competitors who are not paying such a duty on their raw material.

Mr. Kara was optimistic that the export target of 1,000 million yards, fixed at the Buxton Conference, would not be a difficult task for India, "provided a far-sighted, consistent and liberal policy was pursued by the Government simplifying procedure, and removing unnecessary restrictions and handicaps". In this connection, he urged the Goverment of India to emulate the example of the Japanese Government. To quote Mr. Kara: "The Japanese Government, unlike ours, did not hanker after false and

unattainable ideologies in the beginning and lick the feet afterwards. It did not attempt hair-splitting over nationalisation and State control and thus delayed rehabilitaion and expansion schemes, but provided all facilities to private enterprise to go ahead with its various development plans. The Japanese tax system contributed to this recovery in no less degree because, being anything but rigorous, it made possible ploughing back a considerable part of profit and capitalisation of industry's own earnings".

Mr. Kara wanted the Government to remove restrictions on export of mineral khaki, lungi, pseudofine cloth and such other varieties which were in good demand in foreign countries. To what extent this plea is justified it is difficult to say, in view of the nonavailability of statistics regarding the supply position, demand, etc. The chief factor which seems to have weighed with the authorities in restricting the export of mineral khaki is the paramount importance of meeting Defence requirements. With regard to exports of pseudofine cloth, however, there seems to be no points in continuing the ban. The export of this cloth was banned, because the cloth, classified as fine cloth, escaped from export duty levied on medium cloth. If that was the only "hitch", Mr. Kara wondered why the Government should not accept his suggestion that pseudofine cloth might be allowed for export subject to payment of the present export duty.

An important aspect of the export trade in cloth, to which Mr. Kara drew particular attention, relates to the large forward purchases of certain varieties of cloth made by some exporters from the mills. This, he maintained, could not be called speculative buying, since it was based on proper study of the exact requirements of their clients and intelligent anticipation of prospective demand from them. Such exporters as were catering to the specific requirements of their regular overseas clients had very often to take risks in business, in order to book orders as and when received. Mr. Kara sought to drive home the fact, in this connection, that the purchases were made, not for diversion to internal markets—even if prices ruled higher later—but for export only. "This sort of forward buying," to quote him, "is an integral part of the pattern of the export trade in normal times". He added that the method of effecting a purchase from a textile mill, only when one had an overseas order in hand, could not be strictly followed in the prevailing conditions of a buyers' market and free licensing procedure of the Government.

Shaw Wallace and Co., Ltd.

The directors of the above Company (Managing director: Mr. J. E. waterfield, Calcutta) submit the audited accounts of the Company for the year ended 31st December, 1952.

The Company's profit after the inclusion of Rs. 3,47,991 (Rs. 2,62,138) brought forward, is Rs. 25,80,900 (Rs. 35,64,086) and after making provision for taxation of Rs. 6,92,409 (Rs. 12,84,221) there remains Rs. 18,88,491 (Rs 22,76,865). Out of this sum the director have placed to general reserve account Rs. 3,00,000 (Rs. 7,00,000), placed to investment reserve account Rs. 1,50,000 (Rs. 1,50,000) declared as interim-dividends, payable for the year 1952 on the cumulative preference shares as under:—

On 15th July, 1952, 3 (3) per cent. less income-tax Rs. 1,65,937 (Rs. 1,65,937), on 15th January, 1953, 3 (3) per cent. less income-tax Rs. 1,65,938 (Rs. 1,65,937), and recommended the payment of a dividend on the ordinary shares of 10 (10) per cent. free of income-tax, absorbing Rs. 7,50,000 (Rs. 7,50,000), leaving to be carried forward Rs. 3,56,616 (Rs. 3,47,991).

Bisra Stone Lime Co., Ltd.

The directors of the above Company (Managing Agents: Messrs. Bird & Co., Ltd., Calcutta) submit the audited accounts of the Company for the half-year ended 30th September, 1952.

Raisings of limestone at 4,45,575 tons showed a small increase of 6,281 tons, over the previous half-year. Sales too at 4,32,22[illegible] tons, compared favourably with 4,26,5[illegible]5 tons, in the previous half-year. The steel manufacturers have accepted the Company's claim for an increase in price of 3 annas per ton with effect from the 1st June, 1952. This covers increases given to labour from that date. Despatches showed a slight improvement but wagon placements were again short and irregular.

Raisings of dolomite were 11,271 tons, a decrease of 1,604 tons, over the previous half-year due to concentration and development work, Sales, of which 1,448 tons were of first quality dolomite, dropped by 1,760 tons to 11,196 tons.

The output of lime at 4,31,739 maunds showed a most satisfactory increase of 36,913 maunds over the previous half-year. Sales increased by 94,409 maunds to 4,14,282 maunds, the due mainly to the increased wagons supplied for the Calcutta market. The Company is now regaining its market for industrial lime.

There was an illegal strike from the 25th June, 1952, to the 5th July, 1952, both dates inclusive, due to the Union maintaining that the Company had no intention of implementing the conciliation agreement entered into with them in November, 1951. The fact that the Union refused to co-operate when the Company's proposals were put before them, rendered the position untenable.

Output and despatches of limestone, dolomite and lime would have been considerable higher but for this strike.

The profit and loss account after providing Rs. 42,032 (Rs. 44,420) for depreciation, Rs. 1,00,000 (Rs. 1,15,000) for taxation and taking Rs. 52,705 (Rs. 51,599) for quarry overhang reserve, Rs. 25,000 (Rs. 25,000) for mechanisation reserve, Rs. 14,283 (Rs. 14,174) for Workmen's Compensation Act reserve, Rs. 23,000 (Rs. 14,000) for tax contingency reserve and writing off Rs. 7,024

nil) for bad debts and including Rs. 5,729 (Rs. 8,332) brought forward from the previous half-year, shows a credit balance of Rs. 1,03,180 (Rs. 1,12,735) which the directors propose to dispose of in payment of a dividend of As. 14 (As. 14) per share (without any deduction for income-tax paid by the Company) Rs. 37,500 (Rs.87,500) and in carrying forward Rs. 15,680 (Rs. 25,235).

Mirzapur Electric Supply Co., Ltd.

The directors of the above Company (Managing Agents: Messrs. Octavius Steel & Co., Ltd., Calcutta) submit the audited accounts of the Company for the year ended 31st December, 1952.

The revenue account shows a profit on the year's working of Rs. 87,491 (Rs. 89,458) and after deducting arrears of depreciation Rs. 4,189 (Rs.4,192), gratuity to retired employees Rs. 1,108 (Rs. 1,684), bonus to staff Rs. 3,907 (Rs. 3,955) contribution to Vallabhbhai Patel National Memorial Fund Rs. 193 (*nil*), provision for taxation Rs. 15,000 (Rs. 16,000), reserve for deferred taxation Rs. 15,490 (Rs. 17,000) and appropriations under the Electricity (Supply) Act, 1948 Rs. 7,004 (Rs. 7,152), there is a net profit for the (year of Rs. 40,600 (Rs. 39,475). After adding thereto the credit balance of Rs. 677 (Rs. 4,527) brought forward from the previous year and deducting therefrom Rs. 3,866 (Rs. 1,071) payable on coal cost adjustment there is a credit balance of Rs. 37,412 (Rs.43,177) on profit and loss account, which the directors recommend be disposed of as follows:—

Transfer to general reserve Rs. 15,000 (Rs. 15,000) and carry forward Rs. 22,412 (Rs. 677 after paying dividend at As. 8 per share absorbing Rs. 27,500).

The directors have not recommended the payment of any dividend this year. This decision has been taken in view of the fact that finance is required for the expansion of the Company's business by the provision of additional plant and equipment to cater for the considerable further prospective load which exists within the area but which cannot be connected until such time as the present capacity of the Company's system has been augmented. The directors are of the opinion that to set aside funds for the purpose in question is not only the correct procedure to adopt in the interests of the general public, but is also likely to be of ultimate benefit to the Company.

The accounts for the year have been prepared in a form which differs slightly from that adopted in previous years in order to comply with the latest requirements of Government in the matter of allocations.

A continuous supply of electricity was maintained during the year and there was a small increase in the number of units sold as compared with the previous year This increase is not, however, reflected in the profit earned due to the continued upward tendency in production costs.

The number of consumers connected to the Company's system at the close of the year was 1,494 with a connected load of 1,631 k.w., as compared with 1,284 with a connected load of 1,543 k.w., at the close of the previous year. The surcharge of 15 per cent. allowed by the State Governmnt on energy bills still remains in force.

ANTI-RHEUMATIC LINIMENT

Capsicum	1	oz.
Oil of turpentine	1	pint.
Menthol	1	oz.
Oil of origanum	3	dr.
Oil of gultheria	1	oz.
Oil of camphor essence	1	pint.

Macerate the capsicum with the turpentine oil and then add the other ingredients one by one.

CAMPHOR ICE

Stearic Acid	8	lbs.
Lard	10	„
Spermaceti	5	„
White wax	5	„

Melt all the ingredients on a water bath in an earthen or porcelain dish ; strain into a similar vessel; add a solution of 2 oz. powdered borax in 1 lb. of glycerine, previously warmed, to the melted substance when at the point of cooling; stir well ; add camphor, 2 lbs. powdered by means of alcohol 3 oz., stir well and pour into moulds.

CHLORODYNE

I

Chloroform	1 fl. oz.	96 m.
Morphine Hydrochloride		44 gr.
Tincture of Indian Hemp		188 m.
Tincture of Capsicum		144 m.
Liquid Ext. of Liquorice	2 fl. oz.	192 m.
Mucilage of Gum Acacia	2 fl. oz.	192 m.
Treacle	5 fl. oz.	
Glycerine	4 fl. oz.	192 m.
Spirit of peppermint		96 m.
Alcohol 90 p.c. to make	20 fl. oz.	

Dose :—1 oz.

II.

Spt. Menth. Pip.	2	oz.
„ Camphor	2	dr.
„ Chloroform	2	„
Tr. Capsicum	2	„
„ Zingib	2	„
„ Catechu	6	„
„ Digitalis	1	oz.
Acid Hydrochloric Dil	2	dr.
Glycerine	3	oz.
Rectified Spirit	2	„

The above two are used in cholera cases.

CORN SALVE

Benzoated Lard	11	oz.
Yellow Beeswax	2	„
Wool Fat	2	oz.
Salicylic Acid	6	dr.
Methyl Salicylate	2	„

Triturate all the ingredients in a mortar and then pack.

CONCENTRATED DILL WATER

Oil of dill	20	c.c.
Alcohol (90 p.c.)	600	c.c.
Distilled water, sufficient to produce	1000	c.c.

Dissolve the oil of dill in the alcohol and add sufficient distilled water in successive small quantities to produce 1000 c.c. shaking vigorously after each addition. Add 50 grams of powdered talc. and shake ; set aside for a few hours, occasionally shaking ; filter.

Dose : 5 to 15 minims.

STAINLESS IODINE OINTMENT

Iodine	1	oz.
Oleic acid	4	„
Soft paraffin	14	„
Hard Paraffin	1	„

Dissolve the iodine in the oleic acid and mix intimately with the paraffin.

LIQUID EXTRACT OF KALMEGH

Kalmegh	500	grams.
Oil of fennel	2	millilitre.
Oil of ajowan	5	„

Alcohol (90 per cent) a sufficient quantity.

Boil the Kalmegh with 1500 millilitres of water for half an hour and strain. Add further 1500 millilitres of water, boil for half an hour and strain. Repeat the process until a total of 2000 millilitres of the extract are collected. Mix and concentrate to 250 millilitres on the water bath. Dissolve the oil of ajowan and oil of fennel in 200 millilitres of alcohol (90 per cent) and add this alcoholic solution to the concentrate extract.

Dose : 8 to 15 minims.

ASTHMA HERBAL DROPS

Tinct. of stramonium	1	part.
Laudanum	1	„
Anise ammonia	1	„

Mix

Dose : 10 to 15 drops in hot sugar water, thrice daily.

BOILER COMPOUND

Soda ash	87	parts.
Trisodium phosphate	10	„
Starch	1	part.
Tannic acid	2	parts.

Use powdered materials, mixing well and then pass through a fine sieve.

CANDIED GINGER

Ginger grated	1	lb.
Sugar	15	lbs.

Water, sufficient to dissolve the sugar.

Put them into a preserving pan over a slow fire and stir them well, until the sugar begins to boil, then add 1 lb. sugar and keep stirring till it grows thick, then take it from the fire and drop it in cakes on a slab of marble; set it in a warm place to dry.

CHUTNEY

Gur	1	seer.
Green ginger	1	„
Garlic	1	„
Raisins stoned	¾	„
Chillies	4	chs.
Mustard seed	½	seer.
Vinegar		q.s.

Boil the gur to a syrup in one seer of vinegar. Pound the other ingredients and mix them together with the syrup in the other 4 seers of vinegar. Put it into a large jar and keep it out in the sun for a fortnight.

COLOGNE WATER

Bergamot oil	3	fl. oz.
Neroli oil	1	„
Lemon oil	2	„
Lavender oil	½	„
Petitgrain oil	2	„
Rosemary oil	1	„
Bois de rose	½	„
Rectified spirit	12	pints.

Dissolve all the oils except the neroli and rosemary in the spirit. Distil and add the neroli and rosemary.

GINGER BEER POWDER

Bruised ginger	50	parts.
Cream of tartar	60	„
Powdered sugar	9	„
Oil of lemon	1	part.

Mix intimately and put up in 2 oz. packets.

LIQUID PERMANENT HAIR WAVING

Sulphonated castor oil	8	oz.
Sodium pyrophosphate	3	„
Potassium pyrosulphite	16	„
Sodium sulphite	16	„
Soda ash	16	„
Monoethanolamine	5	„
Water	456	„

Mix.

SILVER OR PLATE POWDER

Jeweller's rouge	8	oz.
Heavy magnesium carbonate	8	„
Light precipitated chalk	16	„

Triturate the rouge with 2 oz. of the chalk for 5 minutes, and gradually add the rest of the powders. Shift three times.

SOLD STENCIL INK

Black rosin	20	parts by weight.
Shellac	16	„ „
Bone black	14	„ „
Rosin Spirit	2	„ „
Japan wax	2	„ „
Tallow	1¾	„ „
Hard yellow soap	¾	„ „

Melt the rosin, shellac, and rosin spirit, add the tallow and wax, stir well, add bone black and soap (sliced), stir until all dissolve and incorporate, then turn out into the moulds to set hard.

VALVE GRINDING PASTE

Ammonium linoleate	10	parts.
Oleic acid	1	part.
Water	50	parts.
Green silicon carbide	50	„
Powdered quartz	15	„

Mix. Keep wet while applying.

BAKING POWDER

Sodium bicarbonate	28	parts.
Cream of tartar	60	„
Maize starch	12	„

Mix thoroughly and stock in airtight containers.

NON-SEPARABLE LIQUID BRILLIANTINE

Castor oil	2	oz.
Alcohol 95 p.c.	8	„
Oil of neroli	5	mins.
Oil of rose geranium	10	„
Oil of verbena	5	„
Oil of lemon	30	„

Mix.

PAIN BALM

Yellow vaseline	44	parts.
Methyl salicylate	10	„
Cajuput oil	2	„
Eucalyptus oil	2	„
Menthol	2	„
Wool fat	20	„

Mix thoroughly by trituration and put in wide mouthed bottles.

GRINDING WHEEL

1713 S. G. I., Kadavu—Desires to know a good process of making grinding wheel.

Grinding wheels and other abrasive articles are made with latex as the binder for the abrasive material.

Carborundum grains	300	parts.
Rubber (from latex)	100	„
Sulphur	20	„
Accelerator	2	„

Cure : 2 hours at 287°F.

To the latex mixture made from this formula is added a solution of zinc acetate or other coagulant, the mass being stirred until it has a cheese-like consistency. It is then moulded to shape, dried and vulcanized to the hard rubber stage.

Emery cloth or paper can be made from the formula shown to which glue or casein is added to make the binder more adhesive. It is then spread on fabric or paper, dried and vulcanized in dry heat.

BLACK CYCLE ENAMEL

1849 B. A., Deoband—Wishes to manufacture black cycle enamel.

Ground sandarac	30	lbs.
Gum sandarac	10	„
Castor oil	½	lb.
Aniline spirit black	2	lbs.
Methylated spirit	12	gals.

Dissolve the gums in the spirit, then add the black and castor oil, stir well and filter.

COFFEE ROASTING

2073 V. P. D., Goa—Wants to know the process of roasting coffee and making table salt.

Before roasting the beans after being husked are sorted. They are then put into a revolving cylinder. The beans are then carefully roasted by gradually heating the cylinder. During this time the cylinder is made to revolve. The heating is continued until the aroma is well developed and the toughness destroyed. Too much heat is avoided, as the volatile and aromatic properties of the coffee, and consequently the flavour, are thereby injured; whilst on the other hand, if the berries are roasted too little, they produce a beverage with a raw green taste, very liable to induce sickness and vomiting. When properly roasted, coffee has a lively chocolate brown colour, and should not have lost more than 18 % of its weight by the process. If the loss exceeds 20 % the flavour suffers in proportion. The roasted coffee should be placed in a very dry situation, and excluded from the air as soon as possible because it loses flavour by keeping and also powerfully absorbs moisture from the atmosphere.

TABLE SALT

To make table salt dissolve lump rock salt in four times its weight of water, filter, and then drop into the filtered solution first chloride of barium and afterwards carbonate of soda as long as any precipitate falls. Then filter and evaporate the clear fluid very slowly until crystals begin to appear. When this condition has been reached set aside the solution for a day. The crystals are taken out, dried and kept in bottles.

TEMPERING POWDER FOR STEEL

2097 D. G. A., Poona—Wishes to manufacture tempering powder for steel.

I

Potassium ferrocyanide	30	parts.
Potassium nitrate	30	„
Animal charcoal	30	„
Aloe, powdered	1	part.
Gum arabic	1	„
Sodium chloride	15	parts.

Mix.

II

Animal charcoal	24	parts.
Horn filings	4	„
Glue	6	„
Potassium nitrate	9½	„
Sodium chloride	55	„

LEAD FOR PENCIL

2062 M. N., Banaras—Wants to know a formula of lead pencil.

Methyl violet	33	parts.
Graphite fine	64	"
Gum tragacanth	3	"

Moisten and rub to a uniform paste. Force into forms under pressure and allow to dry thoroughly.

PAIN BALM

1850 K. S., Baltamghat—Wants recipes of pain balm and itch ointment.

Yellow vaseline	44	parts.
Methyl salicylate	10	"
Cajuput oil	2	"
Eucalyptus oil	2	"
Menthol	2	"
Wool fat	20	"

Mix thoroughly by trituration and put in wide mouthed bottles.

ITCH OINTMENT

Vaseline	8	oz.
Hard paraffin	1½	"
Chrysophanic acid	½	"
Ichthyol	1	dr.
Oil of cinnamon	10	drops.

Melt the vaseline and paraffin over a water bath and when liquid add the remaining ingredients and stir till cold.

PURITY TEST FOR GHEE

2041 S. G. B., Bombay—Desires to know a process of testing purity of ghee.

There are various methods of testing ghee but not a particular one will give a correct result. But following a number of processes one may be able to determine the purity of ghee correctly. Of course the refractometer method, which is followed by the ghee dealers one may be able to know whether the ghee is pure or adulterated. No exact proportion of the adulteration may be obtained by this method. The method is very simple and even a novice can find out the result. The apparatus is known as Butyro-refractometer or butter refractometer. It gives colour-fringe of oils and fats together with their refractimetric value of a definite temperature, say at 40°C. In this method it has been proved that the refractometric range for pure samples of butter-fats is limited between 40.0°—43.5° at a temperature of 40°C and the colour fringe observed, though invariably colourless, is also at times violet tinged. Whereas for other types of fats and oils namely, cocogem, coconut oil, groundnut oil, sesame oil, and vegetable ghee. Other respective colour-fringes are deep orange, bluish-green, yelllowish-green and blue.

PAPIER MACHE

1852 M. A. A. K., Ujhani—Desires to know process of making papier-mache.

I

	parts by weight.
Pulp	12
Rosin size	22
Flour	11
China clay	11
Water	44

II

	parts by weight.
Pulp	33
Starch	9
Clay	9
Water	49

Take the pulp in a suitable container pour the water, and add the adhesive and mix. Next add the remaining ingredients and incorporate to the consistency of mortar. The mixing is, of course, performed by means of a kneading machine.

The mass is then pressed in moulds or built up and shaped with a spatula to any desired form; but in the latter case a little only can be done at a time between repeated dryings. For white papier-mache all the materials should be absolutely white, and parchment size or gelatine should be used; but for coloured papier-mache, glue size can be employed. The pulp can be coloured by any mineral pigment, as lamp black, ochre, etc., or may be tinted with aniline dyes. The pressed article should be dried up slowly, or they will not keep their shape. Finally the papier-mache is coated with varnish.

Papier-mache for its weight is an exceedingly tough, strong durable substance, possessed of some elasticity, little subject to wrap or fracture and unaffected by damp. For the finest class of work, such as trays, snuff boxes, and other similar articles, sheets of paper are pasted and powerfully pressed together, so as to acquire, when dry, the hardness of board, and yet to admit, while moist, of curvature and flexture; they are afterwards carefully covered by Japan or other varnishes.

REFINING TIL OIL

1986 B. T. G., Gwalior—Wants to know the process of refining til oil.

One of the oldest methods of bleaching oil is to expose it to the action of animal charcoal in the presence of sunlight for a fortnight in a glass container of which the top is covered with a lid to prevent dirt, dust, etc., from coming in.

The process being a tardy one, the following method is recommended for quick results :—

The oil to be bleached is heated with 2 to 5 per cent of animal charcoal in a vessel over a water bath. This is to ensure that the temperature the oil is likely to get charred. The whole mass is stirred from time to time so that oil comes in touch with fresh surface of charcoal. The heating is contained for about an hour when the oil gets bleached. It is then strained through a cloth. The charcoal may be used over again after revivification.

SNOW

2121 S. M. T. T., Ahmedabad—Wants to know the formulas of snow.

Stearic acid, triple pressed	1¼	lbs.
Cetyl alcohol	1	oz.
Sodium carbonate	2	„
Borax	4	„
Glycerine	½	lb.
Alcohol	6	oz.
Water	58½	„
Perfume	½	„

Dissolve sodium carbonate and borax in half the quantity of water and add glycerine. Melt the stearic acid and cetyl alcohol. Heat both the solutions to 80°C and add the alkali solution to the fat solution gradually with steady stirring. Continue agitating till emulsification occurs. Perfume at 40°C.

The perfume compound may be made by mixing 9 parts of geramium oil (African) with 1 part of patchouli oil.

CURRY POWDER

Coriander	4	oz.
Turmeric	4	„
Cinnamon	2	lbs.
Cayenne	8	oz.
Mustard	1	lb.
Ginger, dry	1	„
Allspice	8	oz.
Fenugreek	2	lbs.

All ingredients should be dry. Grind to fine powder and sift through a fine-mesh sieve. Mix thoroughly. Pack in airtight, moisture-tight container to avoid loss of flavour.

BENDING WOOD

2134 L. C. S., Bangalore—Desires to know a process of bending wood.

There are several processes of bending wood. One of the simple processes is to soak the wood in boiling water for 3 to 6 hours according to its dryness and thickness. Now bend it into required shape by straps and clamps. When got into position by force, leave it for 24 hours or longer and then keep it aside for another 48 hours before any attempt to work it. Care should be taken to compress the inner curves rather than to stretch the outer ones. The first cut from the lower end of the tree gives the best kind of wood for bending, it should be straight-grained, and not too fully seasoned. A simple bend can be made with a rigid former, shaped like a link from a chain, or a thick plate of iron having a hole in it through which the piece of wood that has to be bent can be passed. The sides of the hole are bevelled off to soften the abruptness of a right angle, and the ends of the wood are then clamped down to the flat surface of the plate and kept there till the suppleness and elasticity imparted by boiling has disappeared and the wood retains its altered shape.

DEODORISING KEROSENE OIL

2137 S. S. H., Gaya—Wants a recipe of deodorising kerosene oil.

Kerosene oil	1	gallon.
Chloride of lime	3	oz.
Slaked lime	3	„
Hydrochloric Acid		q.s.

Mix the chloride of lime with the oil, and add hydrochloric Acid until chlorine gas leaves to be given off, mixing thoroughly. Then pour on to the slaked lime, contained in another vessel, and allow it to remain a couple of days. Then well mix up. Allow the lime to subside, and draw off the kerosene.

MARKING INK

6 D. C., Bhadravati—Wants formulas of marking ink, laundry starch, vinegar and tomato sauce.

Aniline Hydrochloride	6	parts.
Dextrin	2	„
Copper Sulphate	4	„
Glycerine, Lime-Free (sp. gr. 1.24)	1	part.
Water		to suit

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

DIFFERENCE BETWEEN RETAIL AND MAIL ORDER BUSINESS

1735 R. L. D., Delhi—Writes, what is the difference between Retail and Mail Order Business.

The retailer depends upon being topical and novel in his display. His shop must be fresh and contain the latest goods.

The mail order business on the other hand, gains its chief success by constant adherence to one unvarying quality, if possible at one unvarying price, the goods being marked with an easily recognised description so that the buyer in December of this year may be able to rely upon getting the same article he got in March of last year.

In advertising the object of retail publicity is to draw buyers to shop ; in mail order business, to keep their attention on the article.

The retailer need not make a profit on the article he advertises. The mail order trader must do so. One can offer goods that will not be repeated—that may even be cleared out in an hour. The other courts disaster if he cannot keep up a constant supply of his advertised brand.

PROSPECTS OF A DAIRY FARM

2597 G. N M., Bombay—Enquires if the business of dairy farming is profitable.

Yes, cow-keeping, if carried out properly can be made paying and profitable. The daily cost of feeding and keeping a cow should not ordinarily exceed three-fourths the price of the milk she gives. If a cow gives 6 seers of milk per day, and the price of milk be 12 annas a seer, her food and keep should not ordinarily cost more than Re. 2/4/- per day. It is profitable to keep large cows yielding much more milk for business purpose. A large cow properly fed and giving 12 seers of milk should never cost more than Rs. 4/8/- a day for her food and keep. But you get Rs. 9/- per day selling the milk 12 annas a seer. Thus you get 100 p.c. profit.

Besides the profit from the milk, there is the calf. If the calf be of a good breed, and proportionately developed at ten months of age it will sell for from thirty to forty rupees. Then again there is the dung. Some people make a great deal of profit from this article. The dung should be gathered every day, and preserved for either manure or fuel. It should be made into cakes or rolls, and dried and sold as fuel, or else a pit should be dug, and the dung and urine collected into it every day. Cow dung and urine make splendid manure. The dung of one cow should fetch from eight rupees to twelve rupees a month. There is money even in the hide, horns, and bones of the cow when she dies.

A cow purchased is, if well managed, so much capital ; a calf born is so much increase on your capital, and the cost of the mother's feed and keep is more than balanced by the milk and butter she supplies.

To ensure success in dairy farming it is of the utmost importance that the best milking breeds be selected. Some people penny wise and pound foolish, and will buy cows of no stable breed whatever and of very inferior milking qualities, rather than pay a decent price for a good and pedigreed one. An ordinary cow can be bought for a few rupees, but she will give little or no milk, and her feed and keep will cost more than her milk is worth. Besides, her calf will sell for hardly anything. This is a great loss in business. It is always more profitable to keep a good cow that will give the required amount of milk than to keep three or four inferior ones that will in the aggregate give that quantity. Four inferior cows will cost more to feed and keep than one or two good ones will.

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of Re. 1 stamps for each question. Subscribers outside India are requested to send eight International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

92 D. R. V., Bombay—Formulas of silver nitrate and mosquito coil will appear in due course.

93 P. K. D., Burdwan—Warm the horn waste when it will be sufficiently soft to be moulded. After moulding dip them in formalin solution, when these will regain their original hardness. For magnesium chloride solution and other chemicals enquire of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta. For tin cans enquire of Bengal Tin Box Mnfg. Co. Ltd., 1, Jadu Nath Mitter Lane, Calcutta-4.

94 R. K. B., Allahabad—Following is the process of manufacturing iron slates: To make iron slates take galvanised iron sheets and wash it with caustic soda solution to free it from grease and oil. Then cut into the required sizes. Next prepare the silicate solution by finely crushing equal parts of solid potash and soda silicate and pouring over this three times the quantity of soft water, which is kept boiling for about 1½ hours, whereby the silicate is completely dissolved. Next take 7 parts of slate finely ground with a little soft water into impalpable paste and mix with 1 part of lamp black. Grind enough of the mass with the previously prepared silicate solution as is necessary for a thick or thin coating with this compound rough galvanised plates are painted uniformly and allowed to set. Finally rub the slate with pumice and apply a coat of infusion of gallnut.

96 B. C. R., Bombay—Following is the process of refining castor oil: Put castor oil in a clean iron boiler supplied with considerable quantity of water. Boil the mixture for some time and skim off the impurities as they rise in the surface a clear oil is at length left upon the top of the water, the mucilage and starch to having been dissolved by this liquid and the albumen coagulated by the heat. The latter ingredient forms a whitish layer between the oil and the water. The clear oil is now carefully removed and the process is completed by boiling with a minute proportion of water and continuing the application of heat until aqueous vapour ceases to rise and until a small portion of the liquid taken out continues perfectly transparent when it cools. The effect of this last operation is to clarify the oil and to render it less irritating by driving off the acid volatile matter. But much care is required to carry out this operation so that not to push the heat too far, as the oil then acquires a brownish blue and acid peppery taste. After the completion of the process put the oil into barrels and send to the market for sale.

99 B. B. S., Jeypore—Following is a list of engineering colleges: Bengal Engineering College, Botanical Gardens, Shibpur, Howrah; Banaras Hindu University, Engineering College, Banaras; Bihar College of Engineering, Patna and University of Roorkee, Roorkee.

100 C. C. P., Surat—In the formula of washing soap you may use 10 lbs. sodium silicate diluted in equal quantity of warm water.

101 G. C. R., Banaras—Process of manufacturing boot polish will be found in Prospective Industries published from this office, price Rs. 3/12/- including postage.

104 D. M. W., Broach—Process of manufacturing vinegar from acetic acid appear will in due course.

106 D. L. L., Saharanpur—Further particulars regarding chlorophyll are not available.

107 S. M. A. H. B., Bezwada—We have no book dealing with the manufacture of eucalyptus oil. Distilling apparatus is required for manufacturing eucalyptus oil. For distilling apparatus enquire of Adair Dutt & Co. Ltd., Stephen House, Dalhousie Square, Calcutta.

108 I. S. S. S., Hyderabad—It is very difficult on our part to suggest names of foreign firms who will take Indian workers.

109 K. M., Nittambuwa—Wants to be put in touch with the manufacturers of Hav mas bro.

110 S. R. S. I., Bobbili—Butter colour emulsion oil lecithin, etc. may be had of Paradise Perfumery House, 7, Colootola Street, Calcutta.

111 J. B. S., Nellore—For dynamite enquire of the following firms: D. N. Biswas & Co., Dalhousie Square; Manton & Co. Ltd., 13, Old Court House Street and N. C. Dutt & Co., 1, Chowringhee Road; all of Calcutta.

112 C. B. D., Cuddapah—Following is a list of catechu manufacturers: Indian Wood Products Co. Ltd., Izatnagar, Bareilly; Jogendra Kumar Birendra Kumar, Najibabad and Bahadurmal Catechu Factory, Champa, M. P.

113 M. F., Srinagar—For leather enquire of the following firms: Bengal Tannery Co., 31/14, Lower Chitpore Road, Calcutta; C. V. Ahmed & Co., P-14, Bentinck Street, Calcutta; Dost Mohamed & Sons, 7, Bentinck Street, Calcutta; Mazhar Salem Leather Co., G. P. O. Box No. 2485, Calcutta; Empire Leather Works, 1/35, Khaleel Mansions, Mount Road, Madras; A. V. Mohamed & Co., 247, Angappa Naick Street, Madras; Cawnpore Leather Industries, Meston Road, Kanpur; India Leather Factory, Civil Lines, Moradabad and Dayal Bagh Tannery, Dayal Bagh, Agra.

114 R. N. G., Srinagar—Following is a formula of sewing machine oil: Almond Oil 9 oz.; rectified benzoline 3 oz.; lavender oil 1 oz. Mix, filter and use.

117 S. N. K., Kanpur—Wants to be put in touch with the suppliers of Rayna oil, punnal oil, tallow oil, bone grease, kitchen grease, and low grade tallow.

119 T. C. W., Kanpur—For ball bearing machine enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta and Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

120 S. R., Calcutta—Following is a formula of ink for typewriter ribbon: Petrolatum 50 parts; lampblack or prussian blue 30 parts; petroleum benzine 10 parts; rect. turpentine oil 10 parts. Melt the petrolatum over water bath and rub into it while hot the lamp black or prussian blue as much as it will take without becoming so dry as to be granular. When partly cool dissolve the whole little at a time in the mixture of petroleum benzine and rectified oil of turpentine. The finished mixture should be of the consistency of fresh oil paint when it will be ready for applying over the ribbons.

121 B. B. G. B. C., Shikohabad—For motor parts enquire of Howrah Motor Co. Ltd., Mission Row Extension, Calcutta; Jain Motor Stores, 14, Bentinck Street; Calcutta and Jyoti Motor Stores, P39, Mission Row Extension, Calcutta-13.

122 A. D. D. I., Baripada—Refer your query to The High Commissioner for India in London, India House, Aldwych, London W. C. 2.

123 P. I., Ludhiana—Transfer labels are printed on special kind of transfer paper which may be prepared as follows: Paper is coated with a mixture of gum and arrowroot solutions in the proportion of 2½ parts of the latter to 100 of the former. The coating is applied in the ordinary manner, but the paper is ony semi-glazed.

125 V. M., Chingleput—Outer shell of tamarind seeds are removed by means of decorticating machine which may be had of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

127 R. C., New Delhi—You may consult Manufacture of Toilet Goods by H. L. Haldar published from this office. price Rs. 4/12/- including postage. For a chemist you may advertise in newspapers.

130 A. P. J., Rohtak—You may write to the Agricultural Departments of respective States for a list of dairy farms managed by Government.

131 J. P. G., Neora—We have no book on colour manufacture. You may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East. Calcutta for a book on colour manufacture.

132 K. B. N., Malaya—Further particulars regarding changing waste into useful article is not available.

134 I. B. S., Nellore—Process of manufacturing mica sheets form mica waste will appear in due course.

135 C. M. V., Baroda—Following is a formula of boot polish: Carnauba wax 3 lbs.; beeswax 1 lb.; hard paraffine 3 lbs.; soft soap 1 lb.; turpentine oil 1½ gallon; oil soluble dye 1 oz. Melt the waxes over slow fire in capacious iron pan. Next add the soap and beat to dissolve. Then slowly stir in the turpentine oil and lastly dye dissolved in a little turpentine oil; when thoroughly mixed extinguish the fire but go on stirring until the mixture begins to thicken. At this stage pour in tins. For black use nigrosine oil soluble for tan use waxoline mahogany and for brown Bismark brown.

136 A. S., Coimbatore—Combs may be had of B. C. Nandy & Co., 71K, Netaji Subhas Road; E. N. Bhesania & Co., 113L, Netaji Subhas Road; G. N. Ganguly & Co., 113M, Netaji Subhas Road and R. K. Kothari & Sons, 115, Netaji Subhas Road; all of Calcutta.

137 N. P., Giridih—We have no book on mica. For a book on mica industry you may consult India Mica By Ramani Ranjan Chowdhury.

139 B. K. S. G., Mekliganj—Following is a list of boot and shoe makers: Central Rubber Works Ltd., 20B, Tangra Road; Globe Tannery, 31/9, 10, Lower Chitpur Road; National Factory, 24, Lower Chitpur Road; all of Calcutta.

141 S. N., Rambha—For retort and other spare parts of drilling apparatus enquire of Adair Dutt & Co., Stephen House, Dalhousie Square, Calcutta.

143 A. I. G. A., Colachel—Tin boxes may be had of Bengal Tin Box Mnfg. Co., Ltd., 1, Jadu Nath Mitter Lane, Calcutta-4; National Sheet & Metal Works Ltd., 36A, Sahitya Parishad Street, Calcutta and Metal Box Co. of India Ltd., 41, Chowringhee Road, Calcutta-16.

144 M. A. B., Holiela—You may consult Manufacture of Toilet Goods by H. L. Haldar published from this office, price Rs. 4/12/- including postage.

145 L. S. R. P., Chapra—For spraying machine enquire of the following firms: Planters Stores & Agency Co. Ltd., 18, Netaji Subhas Road, Calcutta.

153 G. P. S., Darjeeling—Oil engines, rice hullers and oil ghannies may be had of Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta; M. N. Mandal & Co., 67, Madhu Sudan Biswas Lane, Howrah, S. C. Dass & Co., 178, Bellilios Road, Howrah; A. N. Hussanally & Co., 28, Strand Road, Calcutta and General Rice Machinery Stores, 85A, Netaji Subhas Road, Calcutta.

155 B. T. C. W., Dinajpur—Process of manufacturing calcium gluconate will appear in due course.

158 V. B., Ahmedabad—Process of manufacturing glacial acetic acid, formaldehyde, zinc chloride, etc. will be found in Chemical Industries of India published from this office, price Rs. 3/12/- including postage.

160 D. B. J., Gondia—You may consult Manufacture of Leather and Leather Goods published from this office, price Rs. 2/- including postage. You may also consult Poultry Farming, price Re. 1/8/- including postage. For other book on the above subjects you may enquire of Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta and Das Gupta & Co., Ltd., 54-3, College Street, Calcutta.

161 K. S., Gampola—It is very difficult to print all the addresses of biri manufacturers of India in these columns. You may however consult Industry Year Book and Directory from which we quote the following addresses: Biri Trading Co., Manoharpur, Singhbhum; Hindusthan Tobacco Co., Chakradharpur; Bhailal Bhikhabhai & Co., 99-2, Lower Chitpur Road, Calcutta; Mooljee Sicka & Co., 51, Ezra Street, Calcutta and Syed Khader, Washermanpet, Madras.

163 Y. P., Berhampur—In manufacing soap you may use cheap tallow as a substitute for coconut oil which is costly. You may also use punnal oil and karanja oil which are available in your locality.

165 R. C. P., Patna City—Shellac wax and hard paraffin may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta. You have to buy caustic soda from the market and make lye of required strength by adding water. Caustic soda and soft soap may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

166 W. H. V., Kansas City—Addresses you require will be found in Industry Year Book and Directory published from this office, price Rs. 17/- including postage. You may also put an advertisement in Classified Bargain pages of Industry.

168 A. D., Howrah—For pyrethrum oil enquire of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta and Allied Agency, 16, Bonfield Lane, Calcutta.

169 J. S. G. W., Ambala Cantt.—Following is a list of vegetable ghee or vanaspati manufacturers: Amrit Banaspati Co. Ltd., Ghaziabad; Bhagat Oil Mills, 174, Chittaranjan Avenue, Calcutta; Bharat Vegetable Products Ltd., Chatrapur, Ganjam; Ganesh Flour Mills, Delhi; Hindusthan Vanaspati Mfg. Co. Ltd., Ballard Estate, Bombay; Hindusthan Vegetable Products Ltd., 47, Zacharia Street, Calcutta and Modi Vanaspati Mfg. Co., Modinagar.

170 S. T. R., New Delhi—Process of manufacturing paint and thinner will appear in due course.

171 D. P., Patiala—Following is a list of gut dealers: Ad Meyer, 5, South Tangra Road, Calcutta; Arora Brothers, 1, Russa Road, New Delhi; Popular Tennis Gut Factory, Hide Market, Amritsar and Sardar Sheep Gut Mfg. Co., Baghpat Gate, Meerut. Process of manufacturing gut will be found in Utilisation of Common Products published from this office, price Rs. 3/12/- including postage.

172 C. A. D., Lucknow—For firebricks enquire of the following firms: Bengal Bihar Fire Brick & Pottery Works Ltd., 26, Burtolla Street, Calcutta; Mineral Supply Co. Ltd., 31, Jackson Lane, and Firebricks & Minerals Stores Co., 8, Canning Street; all of Calcutta. For selling fireclay you

may negotiate with the above firms. For machineries you may write to Martin-Burn Ltd., 12, Mission Row, Calcutta. For cinema projectors write to the following firms: Sound Equipment Service, 69, Harrison Road, Calcutta; International Talkie Equipment Co., 17, Queens Road, Bombay; and French Universal Talkie Equipment, 36, Dharamtala Street, Calcutta. For cement making machines enquire of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta and Martin Burn Ltd., 12, Mission Row; both of Calcutta.

173 R. K. D., Hosiarpur—For cycle accessories write to Hind Cycle Ltd., Kilachand Devchand Bldg., 45-57, Apollo Street, fort, Bombay; Hindusthan Bicycle Manufacturing & Industrial Corporation Ltd., Phulwari Sharif, Patna; India Cycle Manufacturing Co. Ltd., 9, Tiljala Road, Calcutta and Jai Hind Cycle Works, Old Gurgaon Road, Paharganj, Delhi. For glass bottles enquire of the following firms: Radha Bazar Bottle Stores, 15, Radha Bazar Lane; Nath & Bros., 67, Ezra Street; Bhagya Laxmi Glass Agency, P-33, Pollock Street; Krishna Silicate Glass Works Ltd., 17, Radha Bazar Street; P. S. Dutt & Bros, 7 & 8, Ezra Street; Dilip & Co., P-33, Pollock Street and Imperial Glass Works, 9, Ezra Street; all of Calcutta. Tyres and tubes may be had of R. B. S. Jain Rubber Mills Lilooah, Howrah; Hindusthan Tyre Ltd., Opp. Agripada Police Station, Lamington Road, Near Jacob Circle, Bombay and Bata Shoe Co. Ltd., Batanagar. Pencil may be had of F. N. Gooptu & Co., 12, Belliaghata Road, Calcutta; G. C. Law & Co., 2, Cornwallis Street, Calcutta and Madras Pencil Factory, Washermanpet, Madras. Plywood may be had of Eagle Plywood Industries, 35, Chittaranjan Avenue, Calcutta; Varat Plywood, 67-B, Netaji Subhas Road, Calcutta and Venus Plywood Manufacturing Co., 11, Portuguese Church Street, Calcutta.

174 S. S. S., New Delhi—You may consult Leather and Leather Goods Manufacture published from this office, price Rs. 2/- including postage.

175 M. A. C., Saklaspur—Address of Royal Turf Club is Russell Street, Calcutta.

176 M. B. S., Raipur—You may consult Plastic Industry published from this office, price Re. 1/8/- including postage. Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

177 I. S. C., Peradeniya—We have no book on mica mining. You may however consult India Mica by Ramani Ranjan Chowdhury.

178 S. S. G. C., Kishangarh—Following is a list of arms and ammunition dealers: Goolamhussain Allibhoy & Sons Ltd., 210, Abdul Rehman Street, Bombay; D. N. Biswas & Co., Dalhousie Square East, Calcutta; K. C. Biswas & Co., 1, Chowringhee Road, Calcutta; N. C. Dutt & Co., 1, Chowringhee Road, Cacutta; Singh Bros. (1925) Regd., Kashmere Gate, Delhi and Garg & Co. Ltd., Kashmere Gate, Delhi.

179 S. B., Moradabad—Process of manufacturing lustre polish will appear in due course.

180 P. K. D. R., Jabalpur—Following is a formula of chewing gum: White wax 1 part; paraffin 1 part, tolu balsam 4 parts; benzoin 1 part; sugar 1 part; flavouring matter q.s. Melt the gum, etc. together, and when fluid stir in the sugar and flavouring matter. When cool enough, roll into sticks or cut in dies.

181 S., Mansa—Pill making machine may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

182 S. C. M. C., Deesa—Process of testing ghee appears in this issues.

183 J. P., Jabalpur—For mortar and pestle enquire of Butto Kristo Pal & Co. Ltd., 1 & 3, Bonfield Lane, Calcutta; Calcutta Porcelain Works, 36, Strand Road, Calcutta; Bengal Potteries Ltd., 45, Tangra Road, Calcutta and Hindusthan Potteries, 12, Shib Kristo Daw Lane, Calcutta.

184 V. P. G., Jullundur City—We have no book on lens grinding.

185 M. R., Cuttack—We have no book on toy manufacture.

Factory Reports

Dakra Laboratories Ltd., 18, Nakur Road, Saharanpur have put medicated tooth powder which is claimed to be efficacious in pyorrhoea and other trouble of teeth.

Fountain pen and steel pen inks are manufactured by Free Flow Laboratory, Shikohabad, U. P. Their product is in no way inferior to similar product available in the market.

Trade Enquiries

(To communicate with any party write to him direct with name and address given below mentioning Industry.)

192 S. N. Katigar, Nilla, Gadag—Wants to be put in touch with the suppliers of silk waste in large quantity.

233 Vashisht Trading & Advertising Agency, 18, Nakur Road, Saharanpur—Wants to be put in touch with the suppliers of Harsinghar and Mulseri flowers in bulk.

Export and Import Regulations

IMPORT OF COCONUT OIL

The following Public Notice (No. 120-ITC(PN)/53, dated the 22nd August 1953) has been issued by the Government of India in the Ministry of Commerce, and Industry :—

According to the policy announced for the import of coconut oil falling under S. No. 62 of Part IV in Appendix "A" to the policy Red Book for July-December 1953, established importers can utilise only half the face value of the licences for Import in the form of coconut oil, the other half being utilised for the import of copra or coconut kernel. With a view to making larger supplies of coconut oil available in the country immediately it has been decided that quota licences issued or to be issued for coconut oil for the July-December 1953 period may be utilised for the import of the oil upto two-thirds of the face value of the licences, the remaining one-third being utilised for the import of copra or coconut kernel only.

2. Licences issued already need not be presented to the licensing authorities for amendment of endorsements. The customs authorities have been advised to allow clearance of coconut oil upto two-thirds of the value of the licence held.

LICENSING OF COTTON SEED OIL FALLING UNDER SERIAL No. 61 (a) OF PART IV FOR THE PERIOD JULY-DECEMBER 1953 :—

The attention of the importers is invited to the entries against Serial No. 61(a) of Part IV of the Import Trade Control Schedule in the Red Book for the period July-December 1953, wherein it has been indicated that no licences for vegetable non-essential oils will be issued for the current half year.

2. In view however of continuing shortage of edible oils for the manufacture of vanaspati, etc., it has been decided to consider applications, on merits for licences for the import of cotton seed oil falling under Serial No. 61(a) of Part IV from both dollar and soft currency areas to established importers and actual users like vanaspati manufacturers and other similar consumers of vegetable oils.

3. In dealing with these applications the following considerations will be taken into account :—

(*i*) The applicant's financial ability to import the commodity upto the quantity and value applied for.

(*ii*) The applicant's standing in the vegetable oils trade.

Importers should in their own interest submit as much information as possible with the application in order to enable the licensing authorities to weigh the merits of the case and to decide the value for which licences should be granted.

4. Applications should be made in the form and manner prescribed in the Red Book and should reach the licensing authority at the ports concerned as soon as possible and in any case not later than the 30th August, 1953. Licences will be valid for shipment upto 30th September 1953.

EXPORT OF CASTOR OIL

The following Notices (No. G/203/53, dated the 19th August 1953) has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

A Press Note, on the above subject, issued by the Ministry of Commerce and Industry is reproduced below for information of the trade :—

"In a Press Note, dated the 27th April 1953, the Government of India had announced that exports of castor oil would be freely licensed upto the end of July 1953. The position has now been reviewed in the light of actual exports and it has been decided to permit export of castor oil during the period, August-December 1953, on the basis of performance in the first half of the calendar year. Export licences for the export of castor oil upto the end of December 1953 will be issued to exporters for quantities equal to one-fourth of the total shipped by them in the period, January-June 1953."

2. Exporters, who exported castor oil advised to submit to this office statements showing their exports of castor oil during the above period, supported by relative Bills of Landing and Export Invoices for fixation of their quotas. Such statements will be received in this office upto the 15th September 1953. Statements received after that date will not be given consideration. The quotas granted in accordance with the above procedure will be valid for shipment upto the end of December 1953 to all permissible destinations except Portuguese possessions in India, for which separate procedure for export exists.

Tender Notices

SUPPLY OF LOW TEMPERATURE FREEZER

Office of Issues :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SE-I/25679-D/I.

Due by 10 a.m. on the 6th October 1953.

Sealed tenders are invited for—

Description of Store.	Quantity.
Low Temperature Freezer, i.e., a cold chamber for conditioning stores to minus 65°F (-65°F) Size 18″ × 18″ × 18″ Electric Supply 400/440 volts. A.C. 3 phase 50 cycles. ..	1 No.
Price per tender set	Rs. 2

SUPPLY AND INSTALLATION OF AIR CONDITIONING PLANT

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SEI/2904-D/1.

Due by 10 a.m. on the 6th October 1953.

Sealed tenders are invited for—

Description of Store.	Quantity.
Supplying and installing 7½ ton Air Conditioning Plant with accessories. Electric Supply A.C. 400 volts 3 phase 4 wire 50 cycles.	2 sets.
Price per tender set	Rs. 5

SUPPLY OF BRUSHES

Office of Issue :—The Directorate General of Supplies and Disposals (Miscellaneous Stores Directorate), Shahjahan Road, New Delhi.

Tender No. SM-2/22343-D.

Due by 10 a.m. on the 25th September 1953.

Sealed tenders are invited for—

Description of Stores.			Quantity.
1. Brushes varnish, Flat, rubber set size ..	..	3″	387 Nos.
2. Do.	do.	4″	720 „
3. Do.	do.	1″	3,591 „
Price per tender set	..		Rs. 4

N.B.—Samples :—2 Tender samples of each item are to be submitted to the Deputy Director General (Inspection), New Delhi, free of charge and carriage pre-paid by the 24th September 1953.

SUPPLY OF VACUUM CONCENTRATION PLANT

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SP-I/2809-D/IV/53.

Due by 10 a.m. on the 5th October 1953.

Sealed tenders are invited for—

Description of Store.	Quantity.
Vacuum Concentration Plant, capable of evaporating about 50 lbs. of water per hour ..	1 No.
Price per tender set	Rs. 2

SUPPLY OF PAINT SPRAYING PLANT

Office of Issue :—The Directorate General of Supplies and Disposals, Shahjahan Road, New Delhi.

Tender No. SPIA/25616-D/IV-B/53.

Due by 10 a.m. on the 30th September 1953.

Sealed tenders are invited for—

Description of Store.	Quantity.
Plant, Paint—Spraying 3-gun, self contained with portable compressor Petrol-driven, air reservoir and controls mounted on a two-wheel trolly. Three guns suitable for spraying heavy liquids. Three pressure containers and agitator (one for each gun) ..	2 Nos.
Price per tender set	Rs. 2

SUPPLY OF PUMPING SET

Office of Issue :—The Directorate General of Supplies and Disposals, Shahjahan Road, New Delhi.

Tender No. SPI/2585-D/III/53.

Due by 10 a.m. on the 6th October 1953.

Sealed tenders are invited for—

Description of Store.	Quantity.
1. Flame and explosion proof A.C. Motor driven pear pumping set or equivalent for pumping 2,000 GPH of heavy fuel oil at 50 ft. head	2 sets.
2. Pipes and pipe fittings for the above	1 set.
Price per tender set ..	Rs. 3

INDUSTRIAL PRODUCTION

Industries	Unit	1951	1952	Jan., to March 1953*	Feb., 1953*	March, 1953*	March, 1952
Major Industries.							
Coal	lakh tons	343.08	362.22	92.47	30.61	30.76	30.68
Steel	lakh tons	14.99	15.78	4.08	1.26	1.36	1.35
Yarn	million lbs.	1,304.10	1,448.30	363.0	116.0	116.0	112.0
Cloth	million yds.	4,076.40	4,603.20	1,199.0	381.0	399.0	345.6
Cement	lakh tons	31.96	35.37	8.56	2.66	2.95	2.90
Paper	tons	1,31,916	1,37,504	33,242	10,569	11,022	11,094
Matches	cases	5,77,200	6,08,200	1,58,000	51,100	53,600	48,600
Sugar	lakh tons	11.15	14.19	8.68	2.92	2.66	2.60
Engineering and Electric Industries.							
Machine tools	value in lakhs of Rs.	47.30	44.37	7.76	2.45	2.57	4.11
Electric lamps	lakhs	155.16	208.81	52.90	16.59	17.57	17.57
Dry cells	crore Nos.	14.34	13.02	3.12	1.05	0.98	1.18
Transformers	k.v.a.	1,94,400	2,14,800	68,500	25,600	18,900	16,300
Motors	h.p.	1,42,000	1,57,600	43,200	13,700	15,000	14,600
Electric fans	Nos.	2,12,400	1,95,500	41,500	13,400	13,900	20,000
Radio receivers	Nos.	68,100	71,495	13,487	4,622	4,516	5,975
Storage battery	Nos.	2,10,000	1,58,400	31,700	9,500	12,700	18,800
Cables and wires—							
Copper conductors	tons	3,000	5,928	2,113	747	882	211
Winding wires	tons	300	398	104	44	27	44
Rubber insulated cables and flexibles	lakh yds.	411.60	328.6	103.2	34.4	36.5	31.5
Insulators—							
H. T.	Nos.	2,44,800	3,25,000	75,900	10,200	42,100	40,500
L. T.	lakh Nos.	14.32	30.50	5.09	1.65	2.20	2.76
Chemical Industries.							
Salt	lakh mds.	743.75	768.64	156.19	40.26	85.43	75.69
Caustic soda	tons	14,724	17,058	4,483	1,418	1,615	1,507
Soda ash	tons	47,532	44,322	13,563	3,644	4,930	3,171
Chlorine liquid	tons	5,268	6,240	1,720	566	550	514
Bleaching powder	tons	3,588	792	244	82	86	97
Bichromates	tons	3,276	1,463	551	152	217	100
Sulphuric acid	tons	1,06,932	96,081	25,355	8,099	8,400	6,600
Superphosphates	tons	61,020	46,650	6,343	2,671	2,296	4,304
Miscellaneous (Minor) Industries.							
Sewing machines	Nos.	44,460	50,045	14,963	4,740	5,275	4,206
Hurricane lanterns	lakh Nos.	39.76	35.23	9.21	3.05	3.18	2.68
Bicycles	Nos.	1,14,276	1,96,956	43,210	14,950	17,779	13,182
Cycle tyres and tubes	lakh Nos.	88.38	83.55	20.80	8.80	4.70	7.19
Motor tyres and tubes	lakh Nos.	16.91	13.83	2.95	1.10	0.95	1.47
Cigarettes	crore Nos.	2,194.68	2,058.85	483.96	150.71	148.09	173.40
Plywood—							
Tea chests	lakh sq. ft.	606.48	782.27	144.80	46.01	50.00	77.08
Commercial	lakh sq. ft.	112.00	122.58	42.86	11.61	15.00	11.06
Refractories	lakh tons	2.37	2.43	0.58	0.18	0.19	0.22
Abrasives	reams	37,200	55,000	13,000	4,800	3,400	2,500
Sheet glass	lakh sq. ft.	110.89	90.42	56.82	15.75	15.75	10.40
Woollen manufactures	lakh lbs.	177.00	166.68	39.74	2.38	12.52	9.83
Footwear—							
Western type	lakh pairs	36.40	33.67	8.18	2.68	3.01	3.13
Indigenous type	lakh pairs	20.73	18.06	4.97	1.74	1.56	1.59
Alcohol—							
Industrial	lakh galls.	68.46	68.45	13.01	3.46	4.67	7.99
Power	lakh galls.	58.09	77.42	20.75	5.38	8.07	7.95

Figures are subject to revision month to month. * Provisional.

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Industr

MONTHLY MAGAZINE

In praise of

WEST BENGAL SECRETARIAT
HOME DEPARTMENT

CALCUTTA, THE 30th Jany. 195 3

D.-O. No ....

This is to certify that I had known the work of Signograph Co. in connection with manufacture of transfers from the time that I had been on the East Indian Railway as General Manager. They are a pioneer company in this line and have uniformly done good work and when I took over charge as Director General, Transportation, Government of West Bengal, I found lot of money was being wasted over painting of special signs for the Transport Buses. I requisitioned the services of this company for manufacture of transfers for the State Transport Organisation, Govt. of West Bengal, and they have kept up their reputation and done very satisfactory work in the manufacture of the signs for the State Transport. I wish the company every success.

Secretary & Director General,
Transportation, Govt. of West Bengal.

—CLASSIFIED BARGAINS

[ADV]ERTISEMENTS under this head of small announcements cost 4 As. per word, minimum Rs. 3 [pay]able by Postage Stamp or M.O. with order. No vouchers given.

Readers—In writing to advertisers the Readers are requested to write legibly and quote that [they] are writing in response to advertisement in INDUSTRY. This would ensure prompt atten[tion]. Letters to Advt. No. should be duly stamped.

LIST OF CLASSIFICATIONS.

[Age]nts Wanted
[Age]ncies Wanted
[Age]ncies, Foreign
[Ana]lytical Works
[Ban]k & Insurance
[Bat]tery
[Bill]s, Bonds, Hundies
[Boo]k Binding Materials
[Boo]ks & Periodicals
[Bot]tles & Corks
[Bra]ss Component
[Br]ushes
[Bu]tton & Ivory
[Car]bon Brushes
[Car]dboard Boxes
[Che]micals & Minerals
[Cin]ema Distributors
[Cru]de Drugs
[Cyc]les & Cars
[Cut]lery
[Den]tal & Optical Materials
[Edu]cational & Instructions
[Ex]pert Wanted
[Fil]ter Paper
[Fin]ancial
[Flo]ors & Floor Covering
[Foo]ds & Provisions
[Fir]e Clay
[Fir]e Bricks
[Gar]dening Agriculture
[Hou]se and Land
[Imp]orters & Exporters
[Jew]elleries
[Lab]les
[Mac]hinery & Hardware
Medicines
Miscellaneous Advtg.
Optical Goods
Paint & Colours
Patents & Trade Marks
Perfumery Materials
Perfumery & Toilets
Personal & Professional
Plywood & Bobbin
Photography
Potteries
Publicity
Printing & Stationery
Radio & Electric Goods
Rubber Goods
Rubber Stamps
Sale & Purchase
Scientific Apparatus
Situation Wanted
Situation Vacant
Small Tools
Sports, Music & Arts
Springs
Stamps & Coins
Stocks & Share
Soap Material
Soap & Perfumery
Surgical Instruments
Soda Water Machines
Talkie Machineries
Tea & Confections
Textile Materials
Tin Boxes
Toys
Tobacco
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CONTENTS FOR JUNE 1953.

Contents for JULY ISSUE.

July issue of industry will contain useful articles on industrial and technical subjects such as Manufacture of Liquid Gold; Application of Waxes in Photography; Purification of Fats and Oils; Milk as an Ideal Food; Manufacture of Carbides and Preparation of Cakes in addition to the regular features such as Agricultural Tips; Scientific Researches & Inventions; Engineering Notes; The Business World; Official India; Pharmaceutical Recipes; Formulas, Processes and Answers; Reader's Business Problems and Queries and Replies.

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PROBLEMS OF COAL INDUSTRY

The coal industry enjoys a unique position in the economy of modern industrialised nation and its output is usually regarded as a measure of a country's industrial progress. The output of coal in India has been going up steadily ever since the war and yet the spokesmen of the industry are not satisfied with the present set-up, and they have very strong reasons to think that if things drift as they are now, our coal industry will be caught soon or late in the vortex of a very serious crisis. Among the problems the industry is now facing, the most important are overproduction, high cost of production and dwindling profits, irksome controls imposed by the Government, absence of transport facilities, discrimination against private collieries, the rebate system, and the insufficiency of the scope for exports.

The output position seems highly satisfactory. In 1952 alone, the total quantity of coals raised in the country amounted to nearly 36 million tons. This marks a rise of about 50 per cent over the 1943-44 output. The production of coal in the two previous years was 34 million tons in 1951, and 32 million tons in 1950. Obviously none can question the productive efficiency of our collieries. In fact, it is being maintained at such a high level that the industry can not only meet all internal requirements, but is also exploring opportunities for exporting coal to foreign countries. In 1952 India exported about 37 lakh tons of coal to oversea countries. The United Kingdom used to consume substantial quantities of our coal a few years ago and to-day Middle Eastern countries are among the principal foreign consumers of Indian coal.

What has been stated above shows that the Indian coal industry enjoys a very bright position as far as production is concerned But the spokesmen of the industry and of the trade in coal hold a different view. They say that the present position of the industry is not at all satisfactory even though the production figures are commendably high and quite a number of our collieries are working to their maximum capacity.

They think that most of the coal raised here is lying at the pit-heads and due to a shortage of wagons cannot be transported from producing to the consuming centres. This accumulation of stocks has already created the alleged crisis of overproduction and colliery owners find it impossible to reconcile themselves to the existing set-up of things. Much of their working capital remains immobilised and the fact has already produced a disappointing effect on the investing sectors of our people. Not that wagon shortage is any longer as acute as it was a few years ago. But the improvement in this regard, so far effected by the railways, remains considerably outstripped by the rise in production and the railways have already proved unequal to the most urgent task of providing an adequate number of wagons for the removal of coal to the buying centres. Experts have estimated that at least 3,500 wagons per day will be necessary for the transport of coal from the pit-heads. But as against this requirement which is the minimum, the Railways could provide no more than 3186 wagons per day in March, 1953 and 3178 wagons per day in April this year.

As a result of the transport bottle-neck, hardship is being caused to the industries which consume coal as their fuel. In a recent newspaper article a writer says in this connexion. "As a result of inadequate transport the consuming industries like Paper, Vanaspati, Textiles, Soap, etc., are suffering for want of coal. For instance, it is reported that in the case of textile mills in Ahmedabad the daily intake of coal has been reduced to 30 wagons as compared with the daily requirements of 65 wagons. The position of consumers in the South is even worse." It seems redundant to point out that unless the transport bottle-neck is effectively liquidated in no time, our coal industry is bound to be overtaken by a serious crisis which will only undo whatever progress it has been able to make up till now.

The newspaper article above referred to gives the following details of the coal stocks :—

"The stock of coal with the collieries in Bengal and Bihar was 2.42 million tons in January, 1953, 2.58 million tons in February, 2.75 million tons in March, 2.84 million tons in April, and 3.07 million tons

in May. At this rates it will not be surprising if the stocks reach 4.5 million tons at the end of the year. What hardship the accumulation of stock imposes on the producer he only can understand. His capital is immobilized; there is the possibility of spontaneous combustion, and in extreme cases, even stoppage of raisings and going out of business."

The article further states that the plight of lower grade coals has become pitiable. These coals are the worst victims of the existing transport difficulty, the allotment of wagons which falls to the share of the lower grade coals being as the article puts it, "infinitesimally small." Transport difficulty may well be described as the rock on which have foundered all hopes of progress and the rise in production is just one swallow which can hardly make a summer of prosperity for our coal industry. Remove it we must or the alternative is bound to be a serious crisis, not only for coal but other industries which depend on it for their fuel requirements.

Another major problem which the industry is now facing relates to the rising cost of production and the decreasing profits. Spokesmen of the industry think that the prices of different grades of coal fixed by the Government, are uneconomic. By the Conciliation Board Award of 1947, the wages of labour too have been fixed and these constitute about 60 to 70 per cent of the total cost of production. Workers are given basic rations and this too is a very costly burden on account of the increased prices of foodgrains. It is estimated that the cost of food supplied by collieries to their workers, amounts to no less than Rs. 6 to Rs. 7 lakhs per week. Besides, the prices of stores and machinery have gone up and there has been no corresponding rise in the prices of various grades of coal. Thus, on account of the rising cost of production, the profits of the industry have dwindled to an appreciable extent and more than anything else, this difficulty is now offering a serious impediment to the further progress of our coal industry.

Coal is a well-regimented industry. The Government have imposed very rigid controls not only on prices but also on distribution, production and export of coal. The industry takes the view that these controls—and there is quite a large array of them prevailing at the present moment—have hindered rather than promoted the proper growth and development of the Indian coal industry.

In the years immediately following the war an acute shortage of coal prevailed all the world over and most coal producing countries were unable to cope with the requirements of their consumers. India got an opportunity to step into the export markets of the world. But to-day most coal producing countries have rehabilitated their industry and the Indian coal is facing competition offered by its foreign rivals in the world export markets. The industry is alleging that the loss of the export markets is due to the existing control on the export trade. The industry is urging that the Government should take proper steps to boost up our exports of coal to oversea countries as exports will enable us to overcome the crisis of overproduction. India's coal consumption is bound to rise in the near future. Even so, she will take long to consume all the coal she can produce and so we have to export substantial quantities of our coal to the foreign countries or the industry will have to curtail production to the detriment of its workers and management alike. For the promotion of the export trade, we have to keep a strict eye on two things, namely, that prices should be economic as well as competitive and that the quality of our coal meant for export must be acceptable to our foreign buyers. As things now stand, there exists a good surplus of coal over our domestic requirements and the Government should help the industry to export that surplus.

The distribution of coal to consumers from the collieries is at present regulated by permits. The system causes delay and impedes the normal flow of supply. It is argued that there is no shortage of coal at the present moment and, therefore, the industry should be given greater freedom in the matter of disposing its stocks. Producers of coal resent the rebate system under which they have to allow rebates to consumers or their agents. Certain co-operative societies are reported to have sprung up, sponsored and backed by certain State Governments, whose "sole purpose seems to be to place orders on such parties as are prepared to allow them the maximum rebate so that they can divide the spoils among themselves." A serious malady like this should not go unheeded.

UNEMPLOYMENT PROBLEM

The ghost of unemployment is now stalking the Indian scene. Conditions are now at their acutest in West Bengal where unemployment among the educated middleclass people has become a very common occurrence. There are thousands in the city of Calcutta alone who go out job-hunting from street to street almost everyday and return home in the evening, emaciated in body and mind, only to meet the famished looks of their wives and children. The present cloud, however, is not without a silver lining. We would refer, for example, to the efforts of Dr. B.C. Roy, Premier of West Bengal to thrash out a solution to the knotty problem of middleclass unemployment, and we trust that if the Government chooses to accord top priority to it, the cloud shall lift and the blue firmament of prosperity and contentment reappear to everybody's relief. A climate of peace and sober thinking prevails at the present moment and everybody is awaiting expectantly the Government's blue-print for dealing with the problem of unemployment. Some of the extremists are asking the Government to take a few prompt and drastic steps to alleviate misery created by unemployment. At a crowded public meeting recently held in Calcutta, the Communist Party urged that the price of rice in the statutorily rationed areas be reduced from As. 9 to As. 7 per seer, that the modified rationing system be introduced all over the districts and rice made available at As. 6 a seer; that relief measures be undertaken on a larger scale; that loans be given to cultivators and artisans; and that retrenchment be stopped and the unemployed put on the dole.

According to Mr. A. K. Gopalan, leader of the Communist Group in the House of the People, the problem of unemployment has assumed threatening proportions and the Government must take immediate steps to arrest the growth of unemployment and provide relief for the unemployed. Incomplete figures given by the employment exchanges show that the number of unemployed has increased from 364,679 in October, 1952 to 473,917 in June, 1953 an increase of 109,238 in 8 months and of 184,746 since December, 1951. This means that during the 2½ years of the period of working of the Five Year Plan there has been an addition of more than 50 p.c. to our live register of the unemployed. Mr. Gopalan points out that at the same time the total number of those who were provided with jobs, has been steadily shrinking as the total number of vacancies to be filled have been falling. Between 1947 and June, 1953, the total number of unemployed who have registered their names with the employment exchanges, is about 80 lakhs and not more than 20 lakhs of these unfortunate persons could be given some kind of job or other by the exchanges.

The situation is so very bad that every year about 15 lakhs of educated persons go out in search of jobs and not more than, 1,25,000 of them can secure any. No such reliable figures are available about the unemployed cultivators, but as stated in the 1952 report of the Grow-More-Food Investigation Committee, four-fifths of the cultivators remain occupied for about a third or fourth part of the year and the remaining one-fifth for double that period. Serious unemployment prevails among the industrial workers too.

According to Mr. Ashoke Mehta, the P. S. P. leader, unemployment among them is rising at the staggering rate of 14 lakhs per year. About 30,000 textile workers lost their job in Bombay during 1952-53 as a result of rationalization. Sourashtra, Punjab and West Bengal made an addition of 50,000 to the number. According to the I. J. M. A. about 20,000 persons employed in jute mills went out of employment between 1952 and March, 1953. About one lakh tea garden workers lost their employment in 1952-53. About a third of the men formerly engaged in the country's various engineering industries have lost their job since the end of World War II. About one lakh lac workers and another 50,000 growers of lac are now out of employment. In recent months about 150 shellac and 200 lac factories have had to be closed down. About 50 p.c. of those who were previously employed in the handloom industry are now going jobless, the number of these weavers being about 30 lakhs. The soap industry too is at a standstill, about 70 p.c. of its productive capacity now lying untapped. In consequence, unemployment in this industry is very acute at the present moment.

Whether or not the above figures are correct or dependable, may be debatable. It is for the Government to give us facts and at once go about into the most urgent task of setting things right. Already they have let much grass grow under their feet and the consequences of their inaction or lack of proper action we simply cannot dare imagine beforehand.

GOOD NEWS

West Bengal's Food Minister, Mr. P. C. Sen is reported to have said recently that the State may expect a good winter crop this year. Undoubtedly all will welcome it as a piece of good news, though, of course, the need for caution remains and ought to remain in as much as the Food Minister's prophecy may not come true, if the crop which will be harvested a few months from now, may be laid waste by autumnal inclemencies, by no means a rare calamity as far as our unfortunate State is concerned. However, let us shun cynicism for the moment and hope, if we can, that things will turn up as expected.

According to Mr. Sen, rainfall all over the State has been good in recent weeks, thus ensuring favourable conditions for the growth of the paddy seedlings. The prospect of a bumper aman crop being in the offing, there has been an astonishing fall in the price of rice here recently. The drop in the price of rice is attributed to such other factors as the extension of the modified rationing scheme and the fact that the harvesting of the aus crop has already begun in certain parts of the State. Mr. Sen seems an adept in the art of foretelling what the expected price of rice may be in the near future and this time we have been told by him that the price of rice in West Bengal will stabilize around Rs. 24 per maund by about the first week of October when the aus crop is harvested in Burdwan and other lower West Bengal districts.

The State Government claims in the course of a recent Press Note that "with the expansion of the area under modified rationing the tendency of the price of rice to increase has not only been arrested but reversed".

The Press Note goes on to add as follows:—

"The Government has definitely succeeded not only in wiping out the large disparity between the price of rice in the

surplus and that in the deficit districts but also in reducing the overall price by nearly Rs. 5 per md. compared with the price at this time last year. The State average price, which reached its peak (Rs. 26 per md.) during the last week of July, stood at Rs. 24-3 on Aug. 12. The price on Aug. 13, 1952, was Rs. 28-10".

AID TO HANDLOOMS

Both Mysore and Madras States are taking a keen intererst in placing their handloom industry on an even keel and the Centre has allotted funds amounting to Rs. 45 lakhs and Rs. 1.25 crores respectively to the two States for the purpose. The Government of Madras have taken steps to provide employment to many families of handloom weavers. In Malabar factory owners and handloom weavers have come to a suitable arrangement whereby the workers may earn a decent sum of money. The Madras Government is now examining certain schemes which aim at promoting the development of the handloom industry, and the Central Government too has taken decisions relating to (1) the constitution of a handloom directorate with agencies for internal and external marketing; (2) appointment of commercial travellers for foreign countries; and (3) opening of emporia of handloom goods in foreign countries for marketing handloom products.

Mysore has already drawn up a scheme for giving relief to the handloom industry. The industry's main problem relates to the marketing of its products at economic prices which can ensure living wages for its workers. Good work is now being done in Mysore where under the auspices of the Mysore Provincial Cotton Handloom Weavers' Co-operative Society, 30 centres have been established for supplying yarn to the weavers and purchasing the articles manufactured by them after payment of wages. The Society is making efforts to secure Governmental orders in respect of handloom manufactures. About Rs. 6 lakhs worth of cash and credit facilities have been given to the weavers. Raw silk is also being given them by the Government of Mysore.

JUTE INDUSTRY

Addressing the annual general meeting of the Gunny Trades Association some time ago, Mr. R. Kanoria held the view that the Indian jute industry was now busy contending against certain hostile forces, to overcome which he suggested the adoption of the following measures:—

(1) The Indian jute industry should concentrate on improving the quality of its manufactures.

(2) It should cater to the change in the tastes of its customers. At present it is producing stereotyped standard goods. Although the production of goods suitable for various tastes may have to be small, they will provide a large margin of profits.

(3) Indian exporters of jute goods should develop the habit of foreign tours at regular intervals, as this will provide them an opportunity for studying the market conditions at first hand, for reducing their risks and for building up new lines of business.

(4) Whatever export duties still exist should be reduced to a nominal level with a view to increasing the competitive capacity of the industry.

(5) The cost of production of jute goods should be brought down to reasonable levels. This will require modernisation of the jute mills. The Government should assist the industry in this direction in all possible ways such as securing a loan from the World Bank or providing subsidies.

We have no doubt left in our mind that the above suggestions are well worth implementing without any further loss of time. The outlook for our jute industry seems quite murky at the present moment when it has to contend against the ever growing competition from Continental jute goods and cheaper substitutes which have now come into use in the place of jute-made articles.

NEW COLLIERIES

Not all may take kindly to the recent decision of the Government of India not to entertain any application for the opening of new collieries for the present in Ranigunge and Jharia coalfields. But the decision is not altogether unjustified in view of the fact that the level of production in these coalfields is already quite high and there is an acute shortage of wagons to transport coal from the producing to the marketing centres. Some think that the level of production is not necessarily high and that the transport bottleneck is the main impediment at the present moment. The so-called "own your own wagon" scheme may improve the situation to some extent and in that case there will no longer remain the need to curtail production by imposing restrictions on the opening of new collieries in the regions concerned. That our coal output is not as high as it is supposed to be, is proved by the fact that we have not yet been able to cope with the requirements in full of our domestic and oversea consumers. Obviously, therefore, the most important task our coal industry has to face up to is how to liquidate the transport bottleneck which it reasonably looks upon as the main villain of the piece.

Perhaps, the Government of India does not like concentration of the coal industry in any particular area. There are other regions in the country where the industry is in a nascent stage. Both the Madhya Pradesh and the Union Governments are said to be considering the question of prospecting and exploiting the Champa-Korba coalfields in that State. The scheme for the construction of a 24-mile Champa-Korba railway line aims at providing transport facilities for coal to be extracted in the area. It is said that the Dunlop Company has already finished prospecting an area of 10 square miles and is ready with its plan to extract 25,000 tons of coal per month from that area.

Those interested in the development of our coal industry may not look askance at the Government's efforts to promote regional development of coalfields. But once the transport difficulty is removed to some extent, it should be ready to abandon its policy of not permitting the opening of any new coalfield in the Ranigunge-Jharia regions. The coal reserves of the fields there are not inexhaustible and some of the mines will have to be closed soon or late when their reserves run out. The decision to disallow the opening of new coalfields, therefore, is not altogether wise, even though it does not seem unjustified for the time being.

VISVESVARAYA'S PLEA

Mr. M. Visvesvaraya, President of the All-India Manufacturers Organisation, recently repeated an old theme of this. He wanted the Government to adopt a more efficient system of administration in relation to industries. The present system is century-old and its main weakness is that it is centralised. Other spokesmen of Indian trade and industry have been heard to speak in the same strain from time to time. The plea for decentralisation in regard to the administration of industries by States seem too important to be ignored. It is time the Government

took steps to end the present costly vogue of running all the way to Delhi to represent cases, which is tedious involving as it does so much wastage of time and energy.

As suggested by Mr. Visvesvaraya, there should be a permanent Central Committee and a Committee of Travelling Commissioners. The latter must supervise the working of industries by making on-the-spot studies and solve industrial problems in consultation with the permanent liaison Committee stationed at the Central capital.

Mr. Visvesvaraya's scheme will bring in efficiency if the proposed Committees are manned by the correct type of personnel, in the absence of which new difficulties only will crop up. As he thinks, "the proposed arrangement will render supervision effective, help to maintain a drive, reduce correspondence and formalities, and ensure prompt attention to ailing industries".

PRIVATE INDUSTRIES

The question of industrial development has been left to private enterprise, except in regard to certain key and basic industries, under the Five-Year Plan. But it is difficult to see how the so-called industries now confined to the private sector could come into their own without proper State aid and encouragement. Mr. Sohan Lal, President of the Indian Chamber of Commerce, Punjab (1), therefore, seems to have done well in making the point in a recent speech of his, that it is imperative that the Governments, State and Central, should take steps to dispel the fear complex in the investing sector bred in the Government's attitude of alleged indifference to the promotion of private enterprise. Most Indian capitalists complain that officialdom is bestowing much more attention on the interests of labour and far less on the needs of private enterprise. They also resent the gradually increasing burden of taxes on them.

Capital shortage is the crux of the matter and more than anything else, it is responsible for the present unsatisfactory state of private industries. Mr. Sohan Lal emphasised in this connexion the need for supplementing indigenous capital with foreign capital. He said that the Government should offer a fair and reasonable treatment to the latter, but that does not mean we should be prepared to invite it at any price. As we see it, indigenous sources of capital have not altogether dried up and if the Government can create a congenial atmosphere, as it should, quite a good sum of mony now lying idle will flow back into the field of production.

Mr. Lal criticised the existing lack of uniformity in regard to the levy, collection and administration of sales tax. Complaints of a similar nature have been heard in other quarters from time to time, and it is to be ragretted that no agreement has yet been reached between the Centre and the States in this improtant matter. Mr. Lal welcomed the move of the Punjab Government to set up an industrial finance corporation in the State and said it should provide assistance to sectors which cannot obtain normal banking accommodation. He also suggested that the Corporation should function as an investing trust.

DWINDLING EXPORTS

The foreign consumers of our cotton textiles are now buying less from India and more from Japan. Bombay's COMMERCE has given the following figures showing the position of India's trade in cotton textiles during the first quarter of the year:—

(In Thousand Yards).

Destination.	From India	From Japan.
Siam	210	28,540
Indonesia	610	25,590
U.K.	930	—
U.S.A.	-	15,700
Iran	830	17,210
Ceylon	3,300	5,730
Iraq	1,040	2,970
Phillipines	-	2,380
S. Africa	-	8,710
Br. W. Africa	6,890	8,660
Belg. Congo	130	4,740
Hong Kong	470	970
Ethiopia	390	870
Pakistan	440	300
Australia	2,330	1,320
Other C. W. Countries	10	10
Other Foreign Countries	310	2,680

War had provided a big fillip to our exports of cotton textiles, particularly to the Asian countries but to-day we are once again facing keen competition from Japan. The industry is demanding a total abolition of the remainiig 10 p.c. export duty on medium and coarse cloth. But as we need the stuff for our domestic consumption, the Government is not prepared to concede the demand. We would do well to take steps to boost up the export of our finer varieties of cloth, and to achieve this aim the Government should be ready to relax export restrictions and reduce the import duty on cotton.

HANDLOOM VS. MILLS

The Indian cotton textile industry is eagerly awaiting the findings of the recently appointed Cotton Textile Enquiry Committee and the Government's decisions thereon. In the meanwhile the mills are sparing no efforts to make a case for Governmental assistance to them to come into their own. They are also decrying the existing attitude of favouritism which officialdom is showing towards the handloom industry. Witness, for example, the following points made by the Federation of Indian Chambers of Commerce in the course of its reply to the questionnaire issued by the Enquiry Committee:—

(1) The handloom sector has not been able to make much headway, despite the special assistance given by the authorities for several years now, in various forms, of control over prices, and reservation of markets in certain fields.

(2) The handloom is a very poor machine, in comparison with the powerloom, for producing almost all the fabrics now required on a substantial scale.

(3) The preference of the consumer, either because of patriotic sentiment or of conservatism, is not something that can stand permanently in aid of handlooms, whatever the price disadvantage.

(4) The organisation skill, except in very rare cases, is, if anything, inferior to that available to the mills.

(5) In the absence of any other advantage, the technical inefficiency of the handloom as a machine comes to be reflected in wages paid to the operator; in spite of the handloom weavers earning no more than a mere subsistence wage, the cost of weaving on the handloom is higher than the weaving costs per yard of cloth either on a powerloom or in a mill.

MANUFACTURE OF ICE CREAM

Ice cream may be defined as a whipped and frozen food made from such a mixture of dairy products as will give the desired percentages of milk and milk solids-not-fat, together with sugar flavouring, colouring, often egg products, and usually stabilizer.

Since ice cream is made from a mixture of milk products, sweetening materials, stabilizing agents, and flavouring substances processed and frozen under varying plant conditions, it is by no means a standard product. The percentage of the various solids used varies with not only the opinions of the manufacturer but also the conditions under which he operates. The average fat content of commercial ice cream is probably about 11 per cent, although some ice cream test as low as 8 and some as high as 16 per cent. Similarly, the quantity of milk soilds-not-fat varies from about 9 per cent in richer ice creams to about 12 per cent in those containing a lower percentage of fat. The amount of sugar on a sucrose basis varies from 12 to 15 per cent in plain vanilla ice creams and is 2 to 3 per cent higher in some of the flavoured products, such as chocolate ice cream. Some manufacturers use no stabilizer in their ice cream, whereas others use as much as one half of one per cent.

QUALITY OF THE FINISHED PRODUCT

Inasmuch as repeat sales of ice cream depend to a large extent upon the quality of the product, consideration of the relation of the composition of ice cream to quality is advisable. In discussing composition from this standpoint, the importance of fat and milk solids-not-fat, sugar, stabilizer, and overrun should be considered.

RELATION OF COMPOSITION TO BODY AND PALATABILITY OF ICE CREAM

As might be expected, an increase in the solids content of ice cream, within certain limits, improves texture and increases resistance. For best results, however, there should be proper balance of the solids. Merely to state that the total solids content of a mix should be say, 38- 40 per cent is not enough, as some consideration should be given to the proportion of the different solids.

BUTTERFAT

Butterfat gives ice cream its rich flavour and helps to improve the body. Ice cream with less than 10 per cent butterfat is somewhat lacking in richness, whereas an excess of 16 per cent makes the ice cream so rich that the consumer rapidly reaches the point of satisfaction. Since much ice cream is consumed by children and invalids, the danger, from a nutritional standpoint, of too much butterfat should not be overlooked. In summer ice cream is eaten largely for its refreshing qualities; however, since butterfat produces heat in the body, a high fat content may defeat this purpose. From 10 to 12 per cent is a desirable fat content for commrecial ice cream.

MILK SOLIDS-NOT-FAT

The proper amount of mild soilds-not fat not only aids in producing a desirable body but also prevents the ice cream from having a buttery taste. An excess of these soilds be avoided, as they tend to cover the fat taste and cause a salty flavour if used in too high proportions. Milk soilds-not-fat intensify certain fruit flavours and chocolate or cocoa flavouring. There is more likelihood of ice cream high in milk soilds-not-fat developing a sandy texture

if stored for an unusually long time. As the fat content is raised, the percentage of milk soilds-not-fat should be lowered, although not necessarily in the same proportion. From 10.5 to 12 per cent is the usual amount of milk solids-not-fat used in commercial ice cream.

SUGAR

Ice cream containg less than 12 per cent of sugar (sucrose) is likely to be criticized as lacking in sweetness. An excess of sweetness, however, results in a product that lacks refreshing qualities. Sugar tends to reduce the intensity of some flavours, such as chocolate. Increasing the sugar content lowers the freezing point of the mix, so that the ice cream is less firm. An excess of sugar produces a soggy and rather sticky body. It is desirable, therefore, to limit the sugar content in ice cream to an amount just sufficient to produce satisfactory sweetness (12-15 per cent).

STABILIZERS

Stabilizers, such as gelatin or sodium alginate, improve the texture of ice cream and increase its resistance. The amount of stabilizer needed depends upon its strength and the composition of the ice cream, mixes low solids content requiring more stabilizer than those with high solids content. More stabilizer is needed in ice cream that is heat-shocked during distribution.. An excessive amount of stabilizer should be avoided, as it results in too resistant a body and too slow a melt down of the ice cream. Most stabilizers are of such strength that from 0.2 to 0.4 per cent properly stabilizes the mix.

EGG YOLK

Eggs are added primarily to improve the whipping qualities of the mix and to make the ice cream appear drier at the freezer. At least 0.3 per cent of egg-yolk solids is necessary for this purpose. Fresh, frozen, or dried egg yolk may be used. If more than 0.5 per cent of egg-yolk solids is added in plain ice cream, an egg flavour probably will be noticeable. Egg yolk in the amounts ordinarily used in ice cream has but slight effect upon the body of the finished product. Since egg albumen is of little value to ice cream, whole eggs are seldom used except in special recipes.

OVERRUN

No rule can be given for the proper amount of overrun because of the many different factors which affect the body of ice cream. For instance, an ice cream made from an unhomogenized mix with a 70 per cent overrun will not have the same body as an homogenized product of the same overrnn and composition and made from the same ingredients. Neither will an ice cream containing 35 per cent total solids be comparable to one containing 40 per cent total solids. Also, ice creams of the same composition may vary in body because of differences in the method of freezing. Therefore the manufacturer should study his conditions and by experimentation determine the proper amount of overrun for his particular product. Because overrun has an important bearing upon profits, as well as upon quality, a safe rule to follow is to incorporate the maximum amount of air that will result in an ice cream having the desired texture and resistance, while complying of course, with legal requirements. For packaged goods an overrun of 75 per cent is recommended for a 12 per cent fat mix; for bulk ice cream 100 per cent overrun can be taken on such a mix.

CLASSIFICATION

No standard classification for ice cream exists; consequently there is a tendency among commercial manufac-

turers to confuse terms and names. In general, the following terms are commonly agreed upon:

1. Plain ice cream is made from a basic mix to which a flavour, such as vanilla, maple, chocolate, or caramel, has been added.

2. Fruit ice cream is made from the same ingredients as plain ice cream but contains in addition fruit flavouring, such as strawberry, and usually colouring.

3. Nut ice cream is flavoured with nut meats, such as pecan or pistachio. Sometimes colouring and other flavouring are added.

4. Confection ice cream is flavoured with candy, such as chocolate chip, English toffee, or mint stick.

5. Bisque ice cream is flavoured with grapenuts, cake or macaroons.

6. Pudding is highly flavoured ice cream made from the regular mix or a mix with a high fat content, to which have been added fruits, nut meats, spices, and sometimes liquors. Plum pudding and Nesselrode pudding are examples of this type.

7. Parfait is usually considered to be rich ice cream containing eggs, with or without added nut meats and fruits.

8. Mousse is a forzen whipped cream to which colouring, flavouring, and sugar have been added. Additional milk solids-not-fat are sometimes included in the form of condensed milk or mix. Common flavours used are pineapple, strawberry and maple.

9. Custard may be of either high or low fat content (depending somewhat upon the state law) and is usually richly coloured. Custards ordinarily contain generous amounts of eggs, frequently lemon flavoring, and sometimes spices. Prepared custard flavours also can be used.

10. A product called New York or Philadelphia ice cream is commonly made in some sections of the country. It is usually plain vanilla ice cream highly coloured to appear extra rich, though it may contain extra butterfat and eggs.

11. Water ice is made from sugar, water, an organic acid such as citric acid (or lemon juice) or lactic acid, fruit, and a stabilizer.

12. Sherbet is similar to water ice except that milk solids are substituted for part of the water.

13. Lacto is a frozen product made from buttermilk or starter, eggs, sugar, and fruit juices.

14. Souffle is an ice containing eggs.

15. Frappe is a mixture of fruit juices and flavours, sugar, and citric acid (or lemon); it is served as a drink, either in liquid or semifrozen form.

16. Punch is similar to frappe except that liquors and spices are added.

17. Frozen fruit is a rich mixture of whipped cream, mayonnaise, and fruits, frozen and served on lettuce as the salad course.

18. Novelties. Many novelties are made in the ice cream industry today, and each year more are added to the lists. The more common of these at present are:

(a). Frozen bars made of mixes resembling water ices.

(b). Chocolate-coated ice milk bars, either with or without a stick.

(c). Frozen bars made of mixes resembling water ices.

19. Specialities.

(a). Individual moulds.

(b). Centre and layer bricks.

(c). Pies, cakes, log rolls, and the like.

(d). Souffle cups.

(e). Raised brick designs.

(f). Ripple (variegated) ice cream which is combination of plain vanilla ice

cream and a syrup flavoured with caramel, butterscotch, marshmallow, chocolate, or fruit. The syrup is mixed into the ice cream in such a manner as to produce a marbled effect in the hardened ice cream.

20. Ice milk is a product resembling ice cream except that the fat content is lower and the milk solids-not-fat content is usually higher. Ice milk usually contains 3-4 per cent. fat, 10-15 per cent. milk solids-not-fat, about 15 per cent. sugar, and stabilizer.

21. Frosted malted milk, which usually contains 4-8 per cent. fat, about 10 per cent milk solids-not-fat, 13 per cent sugar, malted milk powder, and a small amount of stabilizer. Chocolate syrup and malted milk are added at the freezer. The finished product is served from the freezer without hardening.

Substandard products are not legal in all states, and in no state can they be labelled ice cream.

RECIPES

Unless otherwise specified, the following recipes are for 10 gal. of finished product.

1. Plain ice creams.

(a). Delmonico

25 per cent cream	40	lbs.
Eggs (whipped and pasteurized with mix)	2	doz. eggs
Sugar	8	lbs.
Gelatin	3	oz.

Vanilla to suit.

If the mix is not homogenized, proceed as follows: Add egg yolks and sugar mixed with gelatin to small protion of cream, cook to custard, and cool. Whip cream and egg whites and and mix with custard.

(b). Caramel sugar heated above its melting point in the presence of water turns brown, the substance formed being called caramel. Mix 8 lbs sugar (preferably half conc and half brown sugar) with 1 qt of coffee cream in a one-piece utensil without a soldered stem. Heat the mixture until it turns dark brown. This amount should be added to 40 lbs unsweetened mix (allowance made thereby for the added sugar).

(c). Chocolate

Cocoa (or 25 lbs chocolate liquor)	15	lbs
Sugar	25	,,
Water	4½	gal.
Salt	2	oz.

Heat to 180°F for 15 min and cool. To 40 lbs of mix add 7 lbs of the above syrup. If chocolate liquor is used, add 8 lbs. of syrup. If practicable, the entire chocolate mix should be homogenized.

Chocolate (2)

Milk	32	lbs.
Sugar	16	,,
Flour	2	,,
Salt	⅛	,,
Eggs	14	,,
Cream	32	,,
Vanillin	¼	,,
Unsweetened Chocolate	4	,,

(d). Butterscotch.—

Granulated sugar	8	lbs.
Butter	1½	,,
Milk	1½	pt.
Water	1½	,,

Add sugar and butter to the water and boil to soft-ball stage (236°F). Keep covered to avoid evaporation and do not stir. Cool to 100°F and add milk. Heat again to boiling. Add to 40 lbs. unsweetened mix.

(e). Coffee.—

The flavour is prepared by boiling 1 lb. good coffee with 3 lbs. water, and using only the liquid. The coffee should not be boiled long enough to become bitter. Add to 45 lbs. mix. An excellent flavour can be prepared by soaking pulverized

coffee in cold water at room temperature for 24 hr. and using only the liquid.

(f). Vanilla malt.—

To 45 lbs. mix add 3 lbs. malted powder and vanilla extract.

(g). Chocolate malt.—

Plain mix	2½ gal.
Chocolate mix	2½ ,,
Malted milk powder	3 lbs.

(h). Mocha.—

Plain mix	3¾ gal.
Chocolate mix	1¼ ,,

Enough coffee extract to impart mild coffee flavour.

FRUIT ICE CREAMS

Usually the best-flavoured ice cream is obtained by use of the true fruit. Only highly flavoured varieties should be used. Fruits ideal for shipping may be unsuited for use in ice cream because of lack of flavour.

(a). Strawberry.—Add 3—4 qt. fresh or frozen berries (depending upon the concentration of the pack) to 45 lb mix. Colour pink. One-half ounce of 50 per cent citric acid solution will enhance the flavour.

(b). Pineapple.—Add 2 qt. crushed pineapple to 45 lbs mix. Prepare pineapple by boiling 10 unsweetened pineapple with 6 lbs. sugar. Coloured pineapple cubes add to the attractiveness of the ice cream.

(c). Cherry.—Add 2 qt. crushed cherries to 45 lbs mix. Colour light red.

(d). Peach.—Add 6—8 qt crushed, well-ripened peaches (fresh or frozen) to 45 lbs mix. Colour light yellow. By using some apricots or nectatines a more distinct flavour is obtained.

(e). Banana.—Add 3 doz well-ripened banana, reduced to pulp, to 45 lbs mix. Colour yellow.

(f). Lemon.—Add the juice of 3 doz. lemons and ½ doz. oranges to 45 lbs mix. To avoid curdling add the juice after the mix starts freezing. Colour lemon yellow.

(g). Oronge.—Add the juice of 3 doz oranges and 1 doz lemons to 45 lbs mix. Add orange colour and, if desired, orange extract to strengthen the flavour.

(h). Raspberry.—Add 2 qt. raspberry puree and sufficient pure raspberry extract to give desired flavour to 45 lbs mix. The addition of a small amount of citric acid solution at the freezer produces a more pronounced flavour.

NUT ICE CREAMS

(a). Pistachio.

To 45 lbs mix add 1 oz pistachio extract and ½ oz green colour. When ice cream partially frozen, add 1½ lbs crushed pistachio nut meats.

(b). Butter pecan.—

Toast pecan halves to a brown colour on inside. Add 1 lb melted butter to 8 1 lb. nut meats. Sprinkle with ⅜ oz. salt. Use 3¼ lbs. to a 40 qt. batch of ice cream.

(c). Black walnut (salad)

Add 2 lbs. broken nut meats to 25 lbs. mix.

(d). Burnt almond.—

Chopped burnt almonds	2½ lbs.
Almond flavour	⅓ oz.
Mix.	45 lbs.

To prepare almonds, mix 1 lb melted butter with 10 lbs. almonds. Toast to a golden brown and cut into ¼-inch pieces.

(e). Caramel nut.—

Nuts	1½ lbs.
Burnt sugar colouring	1 oz.
Caramel flavour	
Mix	45 lbs.

(f). Maple nut.

Maple extract	1½ oz.
Burnt Sugar colouring	2½ ,,
Nuts	2 lbs.
Mix	45 ,,

(g). Cherry nut.

Cherries	3	pt.
Pecans	2	qt.
New Fork colour	¼	oz.
Mix	45	lbs.

CONFECTION ICE CREAMS

(a). *English toffee.*

Butter	2	lbs.
Sugar	5	„
Nut meats (pecans)	2	cups.
Soda	½	tea-spoonful.

Heat butter and sugar to 160°C. Remove from fire and add soda, stirring thoroughly. Mix in nuts and spread on marble slab to cool. Use 3 lbs of candy to 45 lbs. mix.

(b). Almond toffee.

Burnt sugar	3	lb.
Almond flavour	¼	oz.
Broken toffee candy	3	lb.
Mix	45	lb.

(c). Mint stick.

Use 2 lb. peppermint candy (satin finish) to 45 lb mix.

(d). Marshmallow.

To 45 lb. mix add 2-5 lb. marshmallows at the freezer. The marshmallows can be used either dried or fresh. To dry, place them in an oven adjusted for slow heat. They may be cut into small pieces with scissors before drying or broken into pieces after drying. Small marshmallow cubes of suitable size for adding to ice cream can be purchased.

(e). French nougat.

Marshmallows	1	qt.
Lemon flavour	1	oz.
Green and red pineapple bits	2	qt.
Red colour	⅛	oz.
Mix	40	lb.

BISQUE ICE CREAM

To 45 lb. partially frozen mix add 4 lbs. grapenuts, macaroons, sponge cake, or Nabisios, broken into fine pieces. Fruits and nuts may be added.

PUDDINGS

(a) Tutti-frutti.

Red cherries	1	qt.
Green pineapple	1	„
Crushed pineapple	1	„
Raisins	1	lb.
Nut meats	1	„
Mix	45	„
Red colouring		

(b) Orange pudding

Orange extract	4	oz.
Cheese colouring	½	„
Pineapple	1	qt.
Cherries	1	pt.
Raisins	1	lb.
Mix	45	„

(c) Roman pudding

Plain mix	45	lb.
Or 25 per cent. cream	35	„
Sugar	7½	„
Add:—Eggs, whipped and pasteurized with mix	4	doz.
Gelatin	3	oz.
Vanilla	4	„
Orange juice	2	qt.
Lemon juice	1	„
Nuts	4	lb.
Assorted fruits	2	qt.

(d) Nesselrode pudding.

Crushed pineapple	2¼	gal.
Candied citron	¼	„
Cherries	½	„
Fig-walnut mixture	½	„
Raisins	¼	„
Emrelettes	¼	„
Mixing spoon allspice	1	„
Candied orange peel	2	lb.

Use 3 qt. of above mixture to 5 gal. ice cream mix. Add:—

Pecans	¾	lb.
Cashews	½	„
Walnuts	¼	„

(e) Christmas special.

Blanched almonds	20	lb.
Candied citron	15	„
Candied orange peel	15	„

Mince meat	40	lbs.
Dark raisins	20	„
White raisins	20	„
Simple syrup	60	„
Rum, dark, New England or Puerto Pecan	1	pt.

Use 3 qt. to 5 gal. mix.

(f) Plum pudding.

25 per cent. Cream	35	lb.
Condensed milk	5	„
Sugar	7½	„
Or plain mix	45	„
Stabilizer if desired		
Add:		
Eggs (whipped)	3	doz.
Nuts	1	lb.
Raisins	2	„
Pineapple	1	qt.
Cherries	1	pt.
Cinnamon	2	tsp.
Ginger	1	„
Allspice	1	„
Pink coloring.		

(g) English plum pudding.

25 per cent. Cream	35	lb.
Condensed milk	5	„
Sugar	7½	„
Or plain mix	45	„
Stabilizer if desired		
Add:		
Eggs (whipped)	4	doz.
Chocolate syrup	2	lb.
Assorted fruit	2	qt.
Raisins	1	lb.
Figs or dates	2	„
Nut meats	4	„

(h) Date pudding.

Mix	5	gal.
Dates, pitted and ground (the condition is improved by brief gentle cooking to soften)	3	lb.
Chopped walnut meats	1	„

PARFAIT

(a) Plain.

High-fat Mix	45	lb.
Eggs	4	doz.
Vanilla	4	oz.

Cook eggs to custard in portion of mix. Fruits, nuts and flavouring may be added at the freezer.

(b). Coffee.—Add 1 lb coffee extract to plain parfait recipe. Add caramel colouring.

(c). Spumoni.

Whip 1 lb powdered sugar with 1 gal whipping cream. A special spumoni cup should be used. Fill the cup one-fourth full of vanilla ice cream. With a wooden masher dipped in warm water press the ice cream to sides of cup. Half-fill with chocolate ice cream. Place 4 cherries on top of chocolate ice cream and finish filling with fruited whipped cream. Place in hardening room.

MOUSSE

(a) Small quantity (will finish about 5 gal.).

35 per cent. Cream (aged for 48 hr.)	2	gal.
Sugar	4	lb.
Gelatin	2	oz.

Fruits and flavour as desired.

(b) Large quantity (will finish 10-12 gal.).

40 per cent. Cream (aged for 48 hr.)	4	gal.
8 per cent. condensed milk	1	„
Sugar	7	lb.
Gelatin	3	oz.

Place the ingredients in freezer, cool to about 32°F and keep cool until whipped. Care should be taken not to churn the cream by cooling to too low a temperature or by leaving in the freezer too long.

CUSTARDS

(a) Rich flavour.

22 per cent. Cream	40	lb.
Eggs	7	doz.
Sugar	9	lb.

Beat eggs and mix with cream and sugar. Heat to 160°F and cool. Add 1 gal. of this base to 4 gal. plain mix.

(b) Plain custard.

Whole eggs	1	doz.
Skim milk	1	pt.
Whipping cream	1	qt.
Sugar	11	oz.

Beat the eggs, add sugar, and beat again. Mix with the milk and cream and cook until the mixture makes a thick coating on the spoon. Do not heat to too high a temperature. Add to 5 gal. plain mix.

10. New York Ice Cream. Cherry.—

New York colour (egg shade)	⅛	oz.
Cherries (Maraschino)	2	qt.

11. Ice. The basis of an ice consists of:—

Sugar-cane or beet sugar	20	lb.
Corn sugar	7	,,
Sugar-cane or beet sugar	12½	,,
Corn syrup	21	,,
Dry citric acid	5	oz.
Oor 50 per cent. solution (other organic acids, such as lactic, may be used)	10	,,
Pectin or other suitable stabilizer	4	,,

Fruits and flavours, such as the following:—

(a) Orange—3 doz. large oranges or orange extract or emulsion added to suit taste. (b) Grape—2 qt. concentrated grape juice. (c) Cranberry—16 qt. cranberries cooked in water until soft. Strain and use only juice. (d) Apricot—1½ gal. apricots. (e) Strawberry — 1 gal. strawberries (frozen-pack). (f) Pineapple—2 qt. canned pineapple. Enough water to make 10 gal. mix.

SHERBET

The basis of a sherbet is the same as that of an ice except that whole or skim milk, or condensed milk and water, or ice cream mix and water are used in place of all water. The milk solids improve the body and flavour of the finished product. If the batch freezer is used in making the sherbet, add the acid at the freezer so as to prevent curdling. If using the continuous freezer, add the acid slowly at the tank, taking care to have the mix as near 32°F as possible. A suggested formula for a sherbet is as follows:—

Sugar-cane or beet sugar	18	lb.
Corn sugar	7	,,
Or cane or beet sugar	12	,,
Corn syrup	20	,,
Mix (depending on smoothness desired)	12 to 18	,,
Dry citric acid	5½	oz.
Or 50 per cent. solution	11	,,

(Other organic acids, such as lactic, may be used).

Pectin or other suitable stabilizer	4	oz.

Fruits and flavour combinations as desired.

Water to make 10 gal. Whip to 35-50 per cent, depending upon the amount of total solids present.

LACTO (FOR 5 GAL.)

Starter	3	gal.
Sugar	9	lb.
Eggs, whipped	1	doz.
Lemon juice	1½	pt.
Grape juice (or other flavour desired)	1	qt.

Dissolve the sugar in the starter; beat the egg yolks and whites separately and add after the mix is in the freezer.

SOUFFLE

A souffle differs from a sherbet mainly in that it contains whole eggs. Pineapple:

Water of skim milk	3	gal.
Eggs	4	doz.
Sugar	12	lb.
Grated pineapple	1	gal.
Lemon juice	1	qt.

This formula may be used for any souffle by substituting other flavouring.

FRAPPE (FOR 5 GAL.)

Lemons	3	doz.
Oranges	1	,,
Grape juice	2	qt.
Sugar	5	lb.
Water to make	5	gal.

A beter-flavoured product can be obtained by aging the mixture at a low temperature in glass or earthenware containers until a good blend of flavours is obtained.

PUNCH

Water	58	lb.
Sugar	12	,,
Grape juice	1	qt.
Lemon juice	1	,,
Raspberry juice	1	,,

Liquors and spices as desired.

FRUIT SALAD

This product consists of a mixture of mayonnaise, whipped cream, and fruits. The mayonnaise may be prepared as follows:—

Dried egg yolk	½	lb.
Sugar	2	,,
Salt	6	tsp.
Mustard	3	,,
Butter	½	lb.
Vinegar	⅜	pt.
Water	½	,,

Mix the ingredients and heat to about 185°F. (If practicable, prepare in large quantities and homogenize). Add enough cooled mayonnaise to the whipped cream to give it the desired flavour. The above quantity should be used with about ⅜ gal. of ice cream. A small quantity of gelatin will improve the body.

Whole fruit—pears, peaches, apricots, white and red cherries, pineapple cubes or slices—should be mixed with the cream mixture and the whole allowed to stiffen before being placed in brick or seal-rights. About 4 qt. of fruit should be used with the above amount of mayonnaise.

FRUIT ICES FOR BARS

Sugar	100	lb.
Dextrose	33	,,
Pectin	3	,,
Citric acid crystals	2¼	,,
Flavouring material	3	gal.
Enough water to make	90	gal.

SPECIALITIES

(a) French pot ice cream.

The French pot method of manufacturing ice cream was commonly used many years ago. The mix is prepared from rich cream, sugar, and eggs and is cooked at a fairly high temperature, so that a castard-like flavour is produced. Freezing is done in a copper pot, which is surrounded by salt and ice. During the mix is agitated with a paddle, little air is incorporated, so that the product is rather heavy in body and rich in flavour.

(b) Eggnog ice cream.

Mix	5	gal.
Egg yolks, cooked to a custard in a portion of the mix	3	doz.
Lemon extract	1	,,
Egg colour	1½	oz.
Vanilla extract	1½	,,
Dark rum	½	pt.

Spices if desired.

(c) Chocolate cake roll.

Sugar whole milk	3	pt.
Vegetable shortening	1	lb.
Cake flour	3	,,
Eggs	1	doz.
Whole milk	3	pt.
Baking soda	1	oz.
Malted chocolate	4	,,

Cream the sugar and shortening until very smooth, using a mechanical mixer. Add eggs and again mix. Add melted chocolate and milk in which the soda has

been dissolved. Finally add the flour and mix thoroughly about 5 min. Spread the batter in a baker's sheet pan with sides and bottom covered with waxed paper. Bake at 350°F for about 10 min. A crust should form on the surface, which will *prevent the penetration of the ice cream.*

When the cake is cool, spread with vanilla ice cream and *form into* a roll.

(d). Aufait.

This is a brick ice cream consisting of layers of one or more kinds of ice cream, between which are solid layers of frozen fruit. Care should be taken not to make the layer of fruit too thick, since it freezes harder than the ice cream.

MISCELLANEOUS RECIPES

(a) Simple syrup.

I

Sugar	30	lb.
Boiling water	7	qt.

Add the sugar to the water slowly, keeping the mixture thoroughly agitated.

II

High-conversion corn syrup	7	gal.
Water	3	,,

Mix together; no heating necessary.

(b). Eggnog base.

Mix together 12 doz. eggs, 8 lb. sugar, and 6 gal. of 22-per cent cream. Heat to 160°F for 20 min. Cool to 130°F and homogenize at 2,000 lb. pressure. Whip, and serve with liquor.

(c) Sundae toppings.

Fudge formula

I

Sugar	4	lb.
Dextrose	3	,,
Cream 22 per cent.	7	,,
Chocolate liquor	1½	,,
Cocoa	½	,,

Melt chocolate, then add the cream, which has been heated to about 120°F. Add cocoa and sugars while stirring. Heat to 220°F and hold 5 min. Homogenize large batches at 1,500-2,000 lb. pressure. Cool and add vanilla to taste.

II

Cocoa	14	oz.
Sugar	4½	lb.
Evaporated milk	1	qt.
Water	1½	,,

Mix sugar and cocoa. Add milk and water slowly, while stirring. Heat to boiling and hold 5 min. Cool and add vanilla.

Marshmallow topping

III

Sugar	2	lb.
Water	1	qt.
Marshmallows	8	doz.

Mix sugar and water and heat to boiling. Add marshmallows and whip until dissolved.

Raspberry topping

IV

Frozen-pack berries (3 to 1 pack)	4	lb.
Sugar	½	,,
Corn syrup	1	,,
Water	½	pt.
Or fresh berries	3	lb.
Sugar	1½	,,
Corn syrup	1	,,
Water	½	pt.

Strawberry topping

V

Berries	3	lb.
Sugar	1½	,,
Corn syrup	1	,,
Water	½	pt.
Or Frozen-pack berries (2 to 1 pack)	4½	lb.
Water	½	pt.
Corn syrup	1	lb.

A slight amount of citric acid (½ oz. of a 50 per cent. solution) aid in giving tartness. A small amount of colouring may also be added.

Pineapple topping

VI

Corn syrup	1	lb.
Finely crushed pineapple	1	,,

Small amount of green or red colouring or honey	1 lb.
Crushed pineapple	1 „

When a heavier body is desired in the toppings add 0.5 per cent pectin (½ oz to each 6 lb of topping). Mix with boiling water for dispensing.

(d) Ripple ice cream.

A type of ice cream that gained considerable popularity in the late thirties is made by adding some of the common flavours to ice cream in such a manner that the frozen product has a very, ribbonlike appearance when served. This ice cream is a product of the cantinuous freezer and is made by injecting flavoured syrups and gels into the ice cream as it is discharged from the freezer. The flavouring material is forced into the ice cream by a variable-speed pump. Machinery manufacturers have now developer equipment suitable for making the variegated types of ice cream which batch freezers also.

The following precautions should be observed in making ripple ice cream:

1. The ice cream should be firm enough to keep the flavour from settling.
2. The flavouring material should not be so firm as to be chewy, yet should be viscous enough to prevent mixing with the ice cream.
3. The flavouring material should be cold (under 40°F) so as not to warm the ice cream excessively. A cold syrup is also more likely to be of the proper viscosity for adding to the ice cream.
4. The ice cream should be hardened immediately and as rapidly as possible.
5. Because the freezing point of the syrup will probably be lower than that of the ice cream, the hardening room temperature should be kept low.

The most popular flavours are chocolate, fudge, butterscotch, caramel, raspberry, strawberry, pineapple, and marshmallow. For making the fruit flavours prepare a base using the following formula:

Sugar	55 lb.
Water	42.5 „
Pectin stabilizer (or oat gum)	2.5 „

Mix pectin with a portion of the sugar. Add scalding water and mix until pectin stabilizer is completely dispersed. Add remainder of sugar and water to make 100 lbs. To this add fruit and acid as in the following formulla for raspeberry flavour:

Raspberry puree (2 to 1 pack)	33 lb.
Fruit base (sugar, water, stabilizer combination)	66.7 „

The acid is added to thicken the syrup. Citric or a mixture of phosphoric, tartaric, and citric may be used.

Chocolate flavour may be prepared as follows:—

Cocoa	10 lb.
Sugar	54 „
Pectin stabilizer	0.75 „
Water	35.25 „

Mix the pectin stabilizer with 10 lb of the sugar and stir into water. Mix the cocoa with the remainder of the sugar and add to the pectinwater mixture. Heat to 190°F for 20 min. Cool to 40°F and hold at that temperature until used.

A number of very satisfactory commercial products readily prepared can be obtained for use in making ripple ice cream.

In all ripple formulas a satisfactory product can be obtained by replacing one half the sugar with corn syrup or corn-syrup solids. Proper allowance should be made for differences in sweetness.

(e) Diabetic Ice Cream.

For people afflicated with diabetes it is desirable to make an ice cream with a limited carbohydrate content. For this

urpose the following formula may be sed:—

Cream 40 per cent.	37.5	lb.
Skim milk	36	„
Low-lactose milk	36.5	„
Whole egg	1.5	„
Gelatin	0.5	„
Saccharin	0.5	oz.

Mix the egg, gelatin, and saccharin th the cold milk products. Pasteurize, mogenize, and cool. Add 4 lb. glycerin the above batch. The total calories per it of ice cream (270 grams) will be 528. ie caloric value and the presence of ccharin should be declared on the label the package.

If low-lactose mik is not available, the lowing formula may be used:

Cream 22 per cent.	73.5	lb.
Milk 4 per cent.	20.5	„
Whole egg	1.5	lb.
Gelatin	0.5	„
Saccharin	0.5	oz.

Proceed as with the first formula, adding 4 lb glycerin at the time of freezing.

For flavouring diabetic ice cream, materials low in carbohydrates should be used. Pistachio, lemon, lime, orange, mint, and vanilla extracts have been found satisfactory. The use of fruits and chocolate without added sugar is not entirely satisfactory. However, pineapple, peaches, and apricots when well ripened, can be used with limited success. When chocolate ice cream is made, reduce the cocoa to ¾ lb per 5 gal of mix. Heat the cocoa in a portion of the mix to 17°F-18°F for 15 min.

The Corrosion Resistance of Tin

By S. C. Britton, M.A.

ATMOSPHERIC CORROSION

The surface of dry tin is normally covered by an oxide film and quickly gains it on exposure to air if it is stroyed by reduction, solution or rasion. A film isolated by solution of metal in ferric chloride gave stannic ictions. The stannic oxide lattice is ion rich, a character which is expected produce resistance to film thickening l tarnishing. The film does in fact ken only very slowly when the metal heated and begins to show interference ours only at about 200°C. Tin melts 232°C. so that its resistance to oxidan when heated has not a wide application. One use is that of tin for electrical es. Here the resistance of the metal oxidation on heating and to corrosion indoor atmospheres at ordinary temperaes ensues stability in performance over long periods and prevents the formation of a skin as may, on some metals, delay rupture after fusion.

When tin is exposed to sheltered indoor conditions, it remains bright almost indefinitely. Measurements of reflectivity indicated a very slight decline and showed that, if the metal was cleaned every three weeks a water wash restored the metal to its starting condition after three and six weeks' exposure: thereafter a soap and water wash was required, but this sufficed for the twentysix weeks' duraton of the experiment to keep the reflectivity nearly unchanged.

Measurements of weight change showed indoors, tin was less corroded than copper, zinc, or cadmium. The corrosion of tin was trifling but persistent, the weight increment increasing in proportion to the time of exposure.

In a Stevenson screen, with full out-of-door humidity changes but no rain, tin was slightly inferior to copper but superior to nickel. Here the character of the corrosion product came into play and the deliquescent products forming on nickel were harmful to it, whereas the stable basic compounds on copper tended to be protective. The product on tin may be regarded as neutral. In full exposure to the weather tin and its alloys were superior to nickel, copper, brass, zinc, and cadmium in that order.

American exposure tests at a variety of locations over a period of ten years confirm that the good resistance of tin is maintained, although marine exposures caused rather more rapid corrosion than industrial and rural atmospheres.

These long-term tests are rather of academic interest, for tin is unsuited in strength (and in price) to use unalloyed for any purpose involving full exposure to the weather. What is important is the retention of brightness or semi-brightness for a long period in sheltered conditions. The almost indefinite retention of brightness by tin in indoor conditions enables collapsible tin-tubes, tin-foil wrappings and tin-coated steel to provide attractive packages. Some use of tin has been made in the production of costume jewellery from the earliest historic times and still persists.

Pollution of air with sulphur dioxide and hydrogen sulphide, the agents usually responsible for tarnishing and corroding metals, has little effect on tin. Very strong sulphur dioxide pollution, in excess of that in the most grossly polluted industrial atmospheres, causes tarnishing and even darkening, the sulphur dioxide being reduced to produce a sulphide film. Hydrogen sulphide is likely to have some action at temperatures above 100°C.

Tin is attacked by halogens and by vapours of their acids and is therefore etched when above strong solution of these materials. Fluorine is not however active at ordinary temperatures but become corrosive above 100°C.

The vapour from glacial acetic acid corrodes tin but the vapours from weak solutions of the acid, e.g. from vinegar or from wood, have no effect. Tin is also unaffected by the vapours of organic acids which when evolved from some insulating materials frequently cause corrosion of cadmium and zinc in electrical equipment.

The mutual effects of tin and other metals in contact with one another under atmospheric corrosion was studied by exposure of couples in the form of discs. The results do not necessarily indicate what happens at pores in a tin coating but give some guidance as to what may happen when tin or tin coated material is exposed in contact with a large surface of another metal.

In marine environments, the corrosion of tin was stimulated by contact with copper and iron, retarded by contact with zinc and aluminium and unacted by contact with lead and nickel, although in a severe marine exposure, nickel accelerated corrosion. In industrial areas, acceleration was produced by contact with copper and slightly by contact with iron, retardation was produced by contact with nickel, aluminium and zinc and there was no effect with lead. There was some tendency for contact with tin to make iron corrode less in marine enviroments and more in industrial areas.

CORROSION BY ACIDS

In the presence of air, tin suffers some corrosion by mineral acids and by many organic acids. In general the corrosion is slow in the absence of air because of the reluctance of the metal to liberate hydrogen, but is increased by a supply of oxygen, from the air or from an oxidising agent, to act as a depolariser. It is also

increased by influences which improve the chances of hydrogen evolution e.g. rise in temperature and rise in the concentration of acid. Oxidising acids such as nitric are corrosive, and the addition of oxidising agents to any acid is likely to cause increase of attack, but in some circumstances a sufficient addition of an oxidising agent can produce passivity, e.g. chromic acid added to sulphuric and phosphoric acids or hydrogen peroxide added to citric acid in sufficient amount have been shown to stop corrosion.

The effect of limitation in oxygen supply on the action of mineral acids is illustrated by the results quoted in the table below.

Corrosion of Tin by Acids in Presence and Absence of Oxygen

Acid.	Weight loss. (mg. per sq. dm. per day). Under Hydrogen.	Under Oxygen.
Nitric 3 %	630	640
Hydrochloric 6 %	60	11,100
Sulphuric 6 %	35	4,300
Acetic 6 %	15	2,300

Attack by mineral acids is too great to permit the use of tin or tin coatings in handling them, but it is sometimes necessary to clean, with acids, tinned equipment used for other purposes, e.g. to remove a scale deposited from water or milk. From what has been said it follows that, in such a use, nitric acid should be avoided and the weakest acid consistent with effective cleaning should be used, in quiescent conditions. The organic inhibitors used to inhibit the attack of steel by acids during pickling are rather ineffective on tin, but the addition of stannous chloride to hydrochloric acid of below 1 per cent. strength has a pronounced restraining action, at least in the absence of aeration. An addition of 10 p.p.m. stannous ions reduced the corrosion by 0.1 per cent. HCI from 7.2 mg./sq. dm./day, itself a small figure, to 1.6, an almost negligible one. Phosphoric acid has much less action than other mineral acids and is therefore a safer cleaning agent for tin, although organic acids may be better.

Corrosion of Tin in Air-Free Acids.

Concentration per cent.	Duration of experiment (hours).	Weight loss, mg. per/sq. Sulphuric.	calculated as dm. per/day. Hydrochloric.
20	1	290	190
10	1	36	72
5	1	48	36
1	1	24	36
1	10	10.8	6
0.5	10	14.4	10.8
0.1	10	13.2	7.2
0.05	10	8.4	14.4

Corrosion by organic acids is normally slower than it is for mineral acids and the effect of restricted oxygen supply is more marked since the lower hydrogen ion activity makes the evolution of hydrogen more difficult. Comparative figures for weight losses of tin fully immersed in 0.1 N acids without exclusion of air are presented in the Table above. The figure included for for oxalic acid is a gain in weight due to adherent corrosion product: this acid is, however, one of the more corrosive organic acids. The comparatively slow action of phosphoric acid in these conditions is noteworthy.

In the absence of oxygen or oxidising agents from the solution or from the gas above it, corrosion of tin was barely detectable after 28 days' immersion in citric acid/sodium citrate solutions with pH values of 2.4-5.5. In the presence of air, corrosion took place without much effect of the pH value within the range studied and oxidising agents in the solution, e.g. ferric citrate, promoted corrosion even when no air was present.

Tin forms complexions with some organic acids, notably citric and oxalic. The depletion of the solution in tin ions thereby caused has the effect of depressing the electric potential of tin to an extent which makes the metal anodic to steel. The reversal of polarity had been

known to occur long before the explanation of complex ion formation was advanced. It is of very great importance for the handling of fruits in tin-coated steel since anodic corrosion of the tin gives protection to steel exposed at discontinuities in the coating. Meanwhile it should be borne in mind that some of the results quoted in this section for the corrosion of tin may be an uncertain guide to the suitability of tinplate for handling a product, since a slight corrosion of a tin coating may be tolerated when the underlying metal is thereby protected.

Corrosion of Tin (3 × 1 in.) Fully Immersed in 0.1 N Solutions of Acids At 25°C. For Seven Days.

Acid.	pH of solution.	Loss in weight (g.)
Tartaric	2.14	0.020
Lactic	2.23	0.029
Citric	2.32	0.028
Malic	2.41	0.022
Succinic	2.73	nil
Acetic	2.88	nil
Oxalic	1.46	0.058*
Hydrochloric	1.05	0.042
Sulphuric	1.16	0.019
Phosphoric	1.71	0.002

* Weight gain.

Cold dilute solutions of acetic acid are not corrosive to tin but, when hot or strong, the acid is rather corrosive to tin either immersed in it or in its vapour. The weak concentration of the acid above vinegar is not however very corrosive, and vinegar bottle. Results shown in the Table give some indication of the effects of concentration and temperature.

Corrosion of Tin Fully Immersed in Acetic Acid in Presence of Air

Concentration per cent.	Temperature	Corrosion Rate as penetration (in. per month).
20	25°C.	0.000412
	Boiling	0.000896
60	25°C.	0.000511
	Boiling	0.00131
100	25°C.	0.00160
	Boiling	0.0140

Oleic and stearic acids are not corrosive at room temperatures and tin tubes can be used to contain materials, etc, based on them. At temperatures of 330°-340°C. stearic acid was found to be corrosive.

Phenol was found to have no effect after contact with tin for 18 months at 30°C., but above 100°C. some reaction quickly occurred.

The weaker organic acids have usually a negligible action and their use in solutions incorporating organic detergents has been recommended for the cleaning of dairy vessels. For this purpose, their acidity is sufficiently high to prevent scale deposition on the metal but is low enough to avoid corrosion. Gluconic acid has been used commercially and levulinic and hydroxy-acetic acids have been mentioned as possibilities. Insufficient information is, however, available to say how such agents compare in performance and cost with other cleaning agents.

Carbonic acid has only a very slight action and carbonated beverages are safely handled in tin or in tinned metal, although if their acidity is raised by flavouring substances, some wastage of metal must be expected. Beer causes a trifling loss of metal, but this can induce a haze, apparently by the reaction of the trace of tin dissolved with proteins. The action is usually stopped by the formation of an obstructive layer on the tin after a period of use, and there has been an extensive use of block tin pipes for conveyance of beer from cellar to bar. This use is not somewhat diminished as mechanically stronger corrosion-resistant materials have become available, but it has some advantages in providing pipes easy to manipulate and to join.

Much attention was given some years ago, especially in Germany, to the haze produced by tin, since the effect seemed not insuperable and was not as bad as the effect produced by some of the other materials available for piping and for brewery equipment. It was found that the character of the beer was important, the

degree of hazing increasing with acidity and being relatively slight when waters high in carbonate were used for brewing and relatively bad for high sulphate waters.

Although these findings help to explain why experience of haze production varies between users, beer cannot be changed to suit its containers. The important prevention measure appears to be to develop a protective layer on the metal by a period of use and then to guard, by careful cleaning, against its destruction. The pretreatment with beer residues of tinned copper equipment used in the brewery has been recommended, this being carried on until the tin acquires a yellow colour.

In the packing of beer in tinplate containers, the formation of a protective layer would of course avail little, since the initial action would leave permanent effects. Moreover, small quantities of iron such as might be derived from the pores in the coating have an adverse effect on flavour. Special lacquers are thererore used to coat such containers.

CORROSION BY ALKALIS

Tin is corroded by alkalis if the pH be sufficiently high to dissolve the oxide film on the metal. The actual pH value at which this occurs depends on the temperature, the state of the film and the composition of the solution. Potential measurements, made in solutions of sodium carbonate and bicarbonate, with pure tin carrying an oxide film formed at room temperature after abrasion with emery, indicated activity at pH values down to 8.4; but if the film were thickened by heating the metal in air at 210°C., it was not removed by solutions with pH value 11.2. The author has found as-rolled surface to remain passive in solutions with pH values up to 11 at 20°C., but to become corroded at 40°C.

The presence of halide ions a[illegible] to increase the pH necessary for a[illegible] The addition of 0. 06 per cent of s[illegible] chloride to carbonate solutions, act[illegible] pH values above 8.4, raised the thr[illegible] pH for activity above 9.5. Additi[illegible] silicate, phosphate, copper, silver, le[illegible] zinc ions also favoured passivity, sulphide ions promoted activity. thus difficult to predict a limiting value for any complex product, but materials with pH below 11, such a[illegible] less alkaline solutions of sodium phos[illegible] and sodium silicate, are without eff[illegible] ordinary temperatures.

In addition to their effect in raisin[illegible] minimum pH for corrosion to occur, ions have an effect on the rat[illegible] corrosion in solutions with pH v[illegible] above the limit, no doubt owing t[illegible] production of obstructive layers o[illegible] metal surface. Thus, when the corr[illegible] rate is not controlled by some factor than the composition of the sol[illegible] phosphate and silicate solutions are r[illegible] less active than solutions of caustic or soda ash of equivalent alkal[illegible] However, the most important pra[illegible] aspect of corrosion by alkalis arises the use of alkaline detergents for c[illegible] ing tinned ware. In this field, the c[illegible] of the nature and concentration o[illegible] alkali is normally based on the pri[illegible] function of cleaning. Moreover explained below, the amount of corr[illegible] may be controlled by some factor than the composition of the solution, as the aeration of the liquid. therefore difficult to recommend alkaline material for detergent use s[illegible] on the basis of corrosion.

When the pH value to initiate c[illegible] sion is exceeded, the progress of a[illegible] is governed by considerations simil[illegible] those applying to corrosion by acid since the high overpotential res[illegible]

evolution of hydrogen, the corrosion rate depends on the supply of oxygen or other depolarising agent to the metal surface.

The removal of dissolved oxygen by addition of sodium sulphite can make alkaline solutions almost non-corrosive to tin. A practical recommendation is that one part in four of sulphite be added to caustic soda or one part in ten to less corrosive alkalis. The efficiency of this addition depends, in practice, on the conditions of aeration, for in vigorous agitation, the sulphite may be unable to prevent access of oxygen to the metal. Alkaline detergents with a content of sodium sulphite are commercially available.

Although the addition of small amounts of oxidising agents can increase corrosion by alkalis very considerably, the addition of a sufficiency of such materials as permanganates, perborates or chromates can stop corrosion altogether. This has led to some confusion between the reported results of various experiments. Thus, while the accelerating effect of oxidising agents is stressed by some, the addition of chromate or perborate is recommended by others. Clearly the use of oxidising agents to inhibit corrosion requires care and the quantity required must be ascertained for any application contemplated.

As for acid products, quiescent non-aerated alkaline materials can be packed in tin tubes or tin-plate containers. An additional measure of safety can be achieved by adding sodium sulphite to the material to absorb oxygen. Sometimes the alkalinity of a product can be kept below the threshold value for corrosion, e.g. milk of magnesia can have its pH adjusted by a citric addition, with some benefit in flavour.

The main importance of the action of alkalis lies, however, in their use for cleaning, especially in the dairy industry. The precautions to prevent corrosion involve keeping aeration to a minimum, in which addition of sodium sulphite can help, reducing the time of contact between solution and metal and thorough rinsing. A useful code of practice based on these principles is:

1. Clean as soon as possible after use, especially with milk products, in order to reduce the formation of strongly adherent deposits.
2. Use the mildest alkali consistent with the cleaning required.
3. Add sodium sulphite to the solution.
4. Minimize agitation of a type which drags in air.
5. Rinse thoroughly and quickly.
6. Avoid abrasives, which may remove tin mechanically.

Tin is anodic to steel in alkalis and if the two metals are in contact, the corrosion of the tin is likely to be accelerated. Since the steel cathode can evolve hydrogen, corrosion of the tin may be produced even in absence of oxygen. It is therefore desirable that tin being cleaned in alkaline detergents should be kept out of contact with the steel container of the solution.

Chemical sterilisers such as hypochlorite or chloramine T. may corrode tin if used in high concentrations. At 100 p.p.m. of available chlorine, either of these compounds was found to be fairly safe, but at 200 p.p.m. was rather corrosive. The addition of silicate to hypochlorite has been found advantageous. If available chlorine concentrations cannot be kept under control, steam sterilisation is to be perferred for tinned equipment as it is not itself corrosive and leaves no residues.

Of basic materials other than compounds of the alkali metals, ammonia solutions have no action, but some amines have been reported to attack tin. Corro-

sion by fish packed in tinned containers has been stated to depend on the content of trimethylamine oxide, although here the action may depend on the behaviour of the material as an oxidising agent, rather than as a base.

CORROSION BY NEAR-NEUTRAL AQUEOUS MEDIA

In neutral aqueous solutions, the oxide skin on tin usually prevents general corrosion, although the stiffing of incipient corrosion at weak spots in the skin by precipitation of hydroxide may thicken it sufficiently to produce tarnish colours.

Distilled water is almost without detectable solvent action and block-tin pipes may safely be used in its preparation for purposes requiring a highgrade product. Some tarnishing occurs in hot distilled water by thickening of the oxide film, but this is not accompanied by loss of metal.

In solutions containing anions which form soluble tin salts, local break-down can occur with the production of small pits. This type of failure has become known as "Black Spot" formation as the pits appear initially as black spots, usually surrounded by rings of tarnish colours. It may appear in some water supplies, in milk and in other products containing, by accident or design, salts such as chlorides, sulphates and nitrates. Chlorides appear to be most likely to stimulate the action. As corrosion preceeds a solid white product appears above the pits or streaming down from them. This consists principally of stannous oxide with about 20 per cent. of stannic oxide.

Electrochemical measurements have indicated the probable process of formation of the spots. Anodic attack of the metal, beginning at weak points in the oxide film, produces hydroxide and tends to heal the film. The anodic process, however, depletes the solution locally in pH ions and, if a spot is not healed in time, the solution may become, locally, sufficiently acid to permit the formation of a soluble anodic product. At such a spot, the film ceases to be in optical contact with the metal which is eaten away below it. The result is a spot reflecting no light and thus appearing black. In solutions containing anions forming insoluble tin salts, e.g. phosphate, borate ad chromate, the anodic solution of the metal cannot occur and the spots are not formed.

Local corrosion has also been observed in solutions which deposit a scale on the metal and at points where the metal is in loose contact with another solid. Possible reasons are that the screening action of the touching solid produces differential aeration or that the protective skin on the metal becomes preferentially attached to the other surface. Tin, partly immersed in hot hard tap-water, was attacked locally at the water-line, where scale was deposited, but only a slight tarnish was produced in water otherwise similar but freed from scale-forming salts. Nevertheless tin coatings on kettles and other vessels for hot water usually have a long life, the build-up of a firmly adherent scale over the whole immersed surface being probably in the long run protective.

Local corrosion, of the black spot type, although often removing a trifling weight of metal, can cause deep penetration, sufficient to make a gap in a tin coating or even to perforate a collapsible tin tube. Fortunately, the action reaches a destructive stage infrequently, even when chlorides are present, possible reasons being the presence of other salts tending to heal defects in the oxide film and that many surfaces may have only easily reparable defects in their film.

It is clearly desirable that the tin surface shall be as free as possible from scratches and other defects, especially any produced

immediately before contact with a possibly corroding material. Sometimes, particularly for packs in tin tubes, freedom from contamination by isjurious salts, such as chlorides, may be sought in order to avoid any risk of local corrosion. When this is not possible, a slight elevation of the pH or the addition of sodium phosphate may be useful. A further preventive measure, found successful in the dairy industry, and applicable to tinned vessels in other uses is to immerse in the liquid contained in the vessel a zinc or aluminium surface in electrical contact with the tinned surface. The tin, acting as cathode to the second metal, is protected, but the other metal is corroded and will of course contribute some contamination to the contents of the vessel. Conversely, some instances of corrosion of tin coatings have been attributed to their contact with a metal cathodic to them, e.g. nickel-plated immersion-heater sheaths in tinned kettles and tin tubes in bare copper tanks. It is a wise precaution to have all surfaces tinned, except when an anodic metal is deliberately used to protect tin.

Sea-water produces a slow corrosion which gradually spreads over the whole surface, the spread being possibly assisted by scale deposition. Tin bars, exposed for four years to sea-water with total immersion for 93 per cent. of the time, lost weight equivalent to an average penetration of 0.00003 in. per year for 99.2 per cent. tin and .00009 in. per year for 99.75 per cent tin.

The effect of a great variety of near-neutral aqueous materials on tin or on heavy tin coatings is in accord with the outlines of behaviour just given, i.e. it is normally extremely slight, but occasionally, in unfavourable circumstances, local corrosion may be produced. The presence of sulphur compounds may cause staining. Special mention may be made of some materials which have special requirements or which do not obviously fall into the category of neutral solutions.

It is undesirable that drugs should be contaminated by metal or otherwise have their character changed by their containers. Solutions of many drugs were found to contain no dissolved or suspended tin salts after contact with tin for ten hours at 95°C. The materials examined included hydrochlorides of morphine, atropine and cocaine, strychnine nitrate, novocain, and mixtures of caffeine with sodium benzoate and with sodium salicylate. The long-period storage of morphine sulphate in tin tubes was found to produce a haziness resulting from slight corrosion of the metal, and, although the drug seemed unaffected, the use of alternative salts of morphine was explored as a means of avoiding any doubt. Acetate, citrate and lactate and tartrate were all less liable than sulphate to produce the haze and tartrate was without effect after long storage.

Photographic developing solutions are also stringent in their requirements and unfortunately, if they pass over tin, they may pick up sufficient metal to cause fogging a tendency increased if the tin is in contact with a more noble metal.

Formaldehyde solutions used extensively in the plastics industry are required to have low contents of heavy metals. Traces of formic acid tend to make them corrosive to many metals, but tin is unaffected by them, and well-tinned copper is considered suitable for vessels and pipes used in their manufacture.

The maintenance of clarity and colour in wine was found to be adversely affected by contamination with tin. As little as 3 mg. per litre caused some discolouration in red wines and trubidity in white wines, and tin had not a resistance to corrosion adequate to ensure that this limit was not exceeded.

The strong hydrogen peroxide solutions used in rocket propellants must not corrode the metals with which they come into contact and must not have their stability affected by them. Tin was one of the metals found satisfactory.

Tin was affected less than other metals when kept for 36 weeks at various humidities at room temperature in contact with various leathers, tanned with either organic or inorganic materials.

The effects of sulphur-containing compounds and of dairy products are dealt with separately.

CORROSION BY SULPHUR COMPOUNDS IN AQUEOUS SOLUTION

Sulphur itself has no action on tin at ordinary temperatures, but the two elements react vigorously if heated together. Many sulphur compounds will, however, in neutral or feebly acidic aqueous solution, produce surface stains of sulphide, although the loss of metal is trifling. This is not confined to products containing sulphur as sulphide, for other sulphur compounds become reduced at the metal surface. Dilute sulphurous acid will for instance, produce tarnish colours and sometimes may give black deposits of sulphide. This may happen with products containing sulphur dioxide added as preservative.

Many food products, e.g. meats, soups and some vegetables, containing organic sulphur, also produce stains of sulphides of tin. The action is usually only sufficient to produce thin films showing interference tints. The film remains on the metal, but even the discolouration may be objectionable on a container for foodstuff. It can be overcome by the application of lacquers, sometimes pigmented with sulphur-absorbent material and, better, by a simple chemical treatment of the tin. This, the "Protecta-Tin" process, requires brief immersion of the tin or tinned surface in a hot resistance on discontinuities in tin-coatings on steel.

Thin films produced by sulphur compounds have been held by some to be protective. Certainly they do not thicken rapidly and sheets of tin are used to separate sheets of ebonite during the curing process. The sheets may be used many times since the tarnishing has little effect on the good surface finish required to confer its likeness on the product.

CORROSION BY NON-AQUEOUS MEDIA

In general, water-free materials, excepting the halogens, have little effect on tin at ordinary temperatures. Lubricating oils, drying oils, organic solutions and refrigerants can usually be handled in tin-coated metal. The presence of water, especially if accompanied by acidic decomposition products of materials such as chlorinated solvents, can lead to corrosion, the extent depending on the degree of contamination. In pure carbon tetrachloride, the average rate of corrosion during a six months' test was 0.7 mg./sq. dm./day at room temperature; in a mixture with water at the boiling point corrosion was at the rate of 5.6 mg./sq. dm./day.

Common petroleum products have a very slight action on tin and the metal does not promote deposition of gummy products as do some other metals, notably copper. Tin coated steel was found to be unattacked by a variety of fuels, such as petrol, alchol and benzine, or alcohol/petrol mixtures, As with solvents, it is possible for contaminants to induce corrosion, sulphur compounds present together with water being a possible source of trouble.

The inclusion of water in mineral oil can produce some corrosion, although the water-free oils soon produce a protective film on the metal. Olive oil and

peanut oil also were found to have a slight initial action which soon ceased. No reaction between tin and alcoholic solutions of essential oils was found during prolonged storage.

Solutions of acetic, propionic, butyric, lauric, plamitic and stearic acids in benzene were found to have no action on tin, with the exception of a very slight effect by acetic acid.

Tin was found to be unaffected by methanol even when 20 per cent. water was added with and without additions of 2 per cent. formaldehyde or 1 per cent. formic acid.

Carbon disulphide has no action other than the production of a tarnish film.

An instance of corrosion of tin pipes by liquid and gaseous sulphur dioxide has been reported. A crystalline solid was found having the composition SnS_2O_4 (stannous hyposulphite) and giving the reactions expected of such a compound. This action is surprising for anhydrous sulphur dioxide appeared to have no action in tests and the presence of moisture in the corroded installation could not be substantiated. In view of the low temperature involved, a preliminary allotropic change in the tin is a possibility, although practical examples of this change are very rare.

EFFECT OF IMPURITIES IN TIN

In the preceding sections, the results have usually referred to metal without deliberate alloying additions, but possibly containing small amounts of impurities. Adventitious impurities, the commonest being antimony, although not affecting the general trend of behaviour, sometimes have a perceptible effect on the speed of corrosion.

Reference has been made to long term tests in sea-water in which 99.75 per cent. tin suffered a weight loss of, at one situation, about thrice and, at another about twice that suffered by a less pure tin containing 0.3 per cent. of antimony and 0.4 per cent. of lead. The purer metal appeared to be more prone to pitting. When samples of the same metals were exposed to an industrial atmosphere for seven years, the more pure metal lost less weight than the other.

In citric acid solution (0.5 and 1 per cent) in presence of air, an impure tin containing copper, 0.41 per cent.; antimony, 0.25 per cent; lead, 0.13 per cent., and iron, 0.035 per cent., was corroded up to 15 per cent. more slowly than samples containing 99.95 per cent. and 99.88 per cent. of tin, and effect attributed to the presence of antimony. Pure (99.99 per cent.) tin was corroded rather faster by 0. 1 M. solution of hydrochloric or citric acid than a commercial grade having as its main impurities 0.225 per cent of antimony, 0.039 per cent. of lead and 0. 021 per cent. of bismuth. The two materials behaved similarly when immersed in various domestic supply waters. Antimony present in amounts as small as 0. 01 per cent. was found to increase the rate of solution of tin in concentrated hydrochloric acid and in 10 per cent. ferric chloride solution, but bismuth reduced it. The results just quoted and other cited below indicate however that, in corroding media of greater practical importance, the presence of either of these elements in tin is usually beneficial.

Deliberate small alloying additions, especially of copper or antimony, are made in order to produce greater hardness of tin foil. Other additions have been made experimentally in attempts to improve, corrosion resistance or mechanical properties.

In dealing with atmospheric corrosion results for alloys with small contents of copper and antimony, show that 2.2 per

cent. of antimony had no appreciable effect and 0.2 per cent. of copper had a slight adverse effect over a long period of exposure.

Corrosion by 0.5 per cent. citric acid, in presence of air, was reduced by addition of either antimony or bismuth. While 0.25 per cent. and 0.5 per cent. of antimony reduced corrosion by 8 per cent. and 11 per cent. respectively, increased additions produced no further effect. Bismuth additions reduced corrosion slightly more. Antimony or copper additions slightly increased corrosion in sodium carbonate solution, copper producing a rather larger effect.

Aluminium, magnesium and zinc have been reported as harmful impurities in some environments, although only aluminium has an effect of known practical importance.

The presence of small amounts of aluminium in tin is certainly extremely deleterious for exposure to moist conditions. A micro-constituent containing aluminium is selectively and rapidly corroded, leading to inter-crystalline embrittlement. Aluminium tin alloys were found to suffer surface embrittlement on standing in air and alloys with up to 50 per cent. of aluminium decomposed water, with evolution of hydrogen. The exclusion of aluminium from tin used to produce foil is therefore of great importance. Aluminium-tin bearing metals have, however, been used successfully in internal combustion engines.

Alloys of tin with up to 5 per cent. of magnesium were rapidly corroded in water, and were considered to be unsuitable for any moist environment. The presence of 0.1 per cent. of magnesium appeared to be tolerable.

The presence of zinc in fusible tin safety plugs for steam boilers was condemned as leading to the formation of a network of corrosion product that could obstruct the functioning of the plugs. Additions of zinc, of up to 15 per cent., were said to cause intercrystalline corrosion in the atmosphere, but other work casts some doubt on this. It is certain that zinc is not a harmful addition to tin in all amounts in many environments. Alloys of tin with 8-20 per cent. zinc were found to be quite suitable as capping foils for milk-bottles and the good corrosion resistance of electro-deposited tin-zinc alloy is used to provide protective coatings.

It has been found recently that additions of as little as 0.1 per cent of indium, zinc or phosphorus to tin exercise a remarkable restraint on the thickening of the oxide film when the metal is heated in air. These indium and zinc additions also prevented tarnishing in hot water, but did not prevent "black spot" formation in chloride solutions and did not increase resistance to dulling in condensed moisture. It has been reported that larger additions of indium, a "few per cent", prevent local corrosion in sodium chloride solution and that additions of 0.5-3 per cent. improved resistance to sodium carbonate solution. Zinc additions of 0.1 per cent. upwards also were beneficial in alkaline solutions, being notably effective in raising the minimum pH value for corrosion to begin in sodium carbonate solution. This last-mentioned effect seemed to be associated with the production of a carbonate film and in caustic soda solution, it was not observed.

Studies of the effect of grain-size of tin on corrosion by sodium carbonate solution showed the weight-loss was less for finer grained material, grain boundaries being less attacked than the grains. This was true of 99.99 per cent. tin as well as for tin containing 1 per cent. copper, but the grain refinement brought about by some alloying elements was considered to contribute to their effect on corrosion.

Television Outside the Entertainment Field

By Geoffrey Parr M.I.E.E.

Whatever the criticism of television as an entertainment, it is proving a aluable aid to industry and research and ew applications are being found as time oes on. The television camera is the nswer to the often-expressed desire to ave "an eye on a stalk," and as it is omparatively easily replaced it can take ıe place of a human observer who might e exposed to undue hazards or might rish to be in two places at once. When sed in conjunction with a large screen eceiver it gives a presentation that cannot e achieved by any other means.

Admittedly, it is always possible to ıake a record of an experiment and view . by means of a cine projector and screen, ut the time delay in processing may be ıe vital factor which prevents full advan-ıge being taken of the observations. Vith the television camera it is possible ɔ see how an emergency or change in onditions may be dealt with on the spot, nd the sense of immediacy is an added dvantage both to operator and onlooker.

As the first example we may take the se of television in medicine and surgery although this can hardly be classed as n industry). The television camera nstalled above the operating table enables he surgeon to demonstrate his technique o a much wider audience than could be ccommodated in the theatre itself. As Mr. H. J. B. Atkins, a practising surgeon, aid at the recent Television Convention:

"Whereas a good surgical teacher nay have five or six students at his back n any ordinary operating session, the tate of the theatre during a Congrass is uite unmanageable, and the opportunities or a vast audience to derive any substantial benefit from the experience is slight.

"With television the scence is transformed. The operation is conducted in the untrammelled atmosphere which is proper for the consummation of good surgery, and the visitors are able to follow every detail of the procedure in comfort."

It is gratifying to note that one of the first permanent television installations for surgical teaching was installed in the theatre of Guy's Hospital. The added advantages of large screen projection make the demonstration of small surgical operations available to a wider audience than could have ever been accommodated in the ordinary theatre.

REMOTE CONTROL

From remote viewing it is only a step to remote control. The television camera can be used to convey the image of a remote happening, experiment or meter reading to an operator, who can make adjustments at a safe distance and observe the effects. An intricate remote manipulating apparatus, developed in U.S.A. is used to handle radioactive material which would be dangerous to an unprotected operator. The television camera is fitted with stereoscopic lenses. The operator wears Polaroid glasses to resolve the stereoscopic picture: and by means of the hand manipulators is able to pour liquids from one flask to another under completely safe conditions.

On a large scale, the camera can be used to control heavy loads, and at a recent Mechanical Handling Exhibition

a crane was demonstrated under the control of an operator who did not have direct view of the work he was handling.

More recently, television equipment of a similar type has been used in the dismantling of the heavy water pile of the Canadian atomic energy project at Chalk River.

UNDER-WATER TELEVISION

One of the more spectacular achievements of television was the location of the sunken submarine *Affray* in 1951. The camera used for this was surrounded by a ring of floodlights for illuminating the sea depths. Apart from being able to operate at depths that would be dangerous for divers, the camera is easily manoeuvrable, and if accompanied by remotely controlled 'hands' it can take the place of men whose lives are too valuable to risk at great depths.

Apart from its obvious uses in locating sunken objects, the camera opens up a wide field of exploration of the sea bed and marine life in general. The Scottish Marine Biological Association has already proved the value of under-water television equipment for the examination of plant and animal life at considerable depths, and those who have seen the quality of picture already obtained by Dr. Harold Barnes of tht Millport research station are considerably impressed with the possibilities of this technique for marine biological research.

INDUSTRIAL EQUIPMENT

The use of television in industry generally involves the transmission of an image over short distances, and if the radio frequency link is omitted the equipment can be correspondingly simplified. A modern lightweight camera measures only 12 by 6½ by4½ in. and with its tripped and spare tube can be packed in a case weighing only 13 lb. All the controls can be operated from the receiv[e] unit which can be situated at any distanc[e] up to 300 yds., and this provides th[e] scanning and synchronising signals fo[r] the camera. The whole equipment ca[n] thus be transported to any convenient site and left without attention for as long as desired.

In the absence of the radio broadcast requirements it is possible to modify the scanning system, especially where fineness of detail can be sacrificed. This leads to a reduction in the frequency band-width employed and simplification of the circuits —a useful feature when it is desired to transmit over existing communication channels.

TELEVISION IN ASTRONOMY

It has already been shown that the latest form of camera tube is more sensitive than the fastest photographic plate for the same exposure time. A more important feature of the modern camera is that the photo-electric emission from the sensitive 'mosaic' is proportional to the amount of incident light received even at very low intensities. The camera, therefore, is more accurate than the photographic plate for recording very faint images in astronomical photography. The photoelectric mosaic also possesses a 'memory', in that the charges stored on its surface remain long enough to be built up by successive exposure, and there is thus a close similarity between the television camera and the photographic camera with the advantage of increased sensitivity. It is probable, therefore, that the photo-electric camera will be used for reproducing faint star images on a recording screen for subsequent photography. By the choice of photo-electric material the camera can be made sensitive to a particular range of wavelengths, such as the infra-red and ultra-violet.

The applications of television technique already mentioned are fairly obvious examples of the "eye on a stalk", but there are many other possibilities which are only now being realised. The uses of high-speed photography in analysing rapid movement are well known, but this entails elaborate equipment and an inevitable delay before the results can be shown on the screen. A television camera can also take an instantaneous picture, and its memory' will enable the image to be reproduced a second or so later. It would thus be possible to observe a rapidly moving object by a series of timed glimpses on the principle of the stroboscope and reproduce them at a slower rate on the receiver screen.

This has the merit that adjustments can be made to the mechanism and the results observed simultaneously.

The technique of television scanning has also been applied to microscopy, the object being trans-illuminated by the light from a high-intensity cathoderay tube screen and the resulting image being amplified by a photo-multiplier and shown on a receiving screen. It is claimed that the reproduced picture is superior to that from an ordinary projection system in brightness, contrast and resolution.

SCANNING MICROSCOPE

The scanning technique also enables particles in the field to research workers who cannot invest in an expensive electron microscope, and the scanning microscope may prove superior to the electron microscope in quantitative measurements.

So far the question of colour has not been considered, in radio transmission the colour television system involves circuits of much greater complexity than in monochrome transmission, and the frequency band-width required for correct rendering of detail is much wider. Industrial equipment operating with a cable connection between the camera and the receiver gives a better opportunity for use of colour without adding too much to the cost of the system. In certain application, coloured reproduction will be essential if full advantage is taken of the television picture for educational purposes. A surgical operation for instance, will only be fully instructive, if the details of the tissues are shown in their natural colour, and many chemical changes require close observation of colour by the remote operator.

In the final development of the television aid to research we may expect to use a transportable colour camera and projection type reproducer with an accompanying collapsible screen similar to that of the miniature cinema. The operator will be able to select one of a number of lenses to give a close-up of part of the scene, and, of course, no additional lighting will be necessary.

The television camera offers a new and unique medium for educational demonstrations, but its properties can only be exploited to the full by developing a new demonstrating technique to suit. Thus a demand may arise for specialist lecturers who will combine a thorough knowledge of the subject with ability to make a good running commentary on the work being shown. This would infuse new life into otherwise dull scientific subjects, and it is to be hoped that some lecturers in future will prove as attractive as other television displays that are officially classed as entertainment.

—THE HINDUSTHAN STANDARD.

MAINTAIN THE FERTILITY OF THE SOIL

The maintenance of fertility is essential to national welfare and to the prosperity of the individual farmer. Efficient crop production requires that soil fertility be maintained or improved as well as the production methods be such as to produce crop at a profit. Our pioneer farmers and the generation immediately following them were as a rule experts in crop production but they gave little attention to the maintenance of fertility. Present day farmers are for the most part, faced with the additional problem of restoring and maintaining fertility on soils more or less depleted. Fortunately, scientific soil investigation, coupled with the demonstration in practice on many farms have proved that it is possible to produce crops profitably and at the same time improve fertility, provided the right methods are followed. The following operations have been found useful in stimulating fertility in depleted soils:

(1) Grow legumes to maintain the supply of nitrogen and organic matter.

(2) Return manure and crop residue to the land.

(3) Apply lime where necessary.

(4) Use the most profitable fertilisers.

(5) Till poorly drained land.

(6) Carefully plan your rotation and system of fertilisation.

SEASONAL MANURING

Rice is the staple food of the people of this country. So it is essentially necessary that cultivators must have recourse to proper manuring and thereby produce a large quantity of paddy for local consumption as well as exportation. Those soils which are intended for Aman Paddy should receive steamed bonemeal at 160 lbs. per acre immediately before the seedlings are planted. Nitrate of soda at the rate of 60 lbs. per acre is to be applied after transplantation but before the fields are flooded. If diligently followed with additions and alterations to suit different conditions this manuring may be expected to increase the yield by about 6 mds. per acre, according to the results of many trials conducted by the agricultural department over a number of years.

Pre-monsoon cotton will be sown in Madhya Pradesh Bombay and parts of Bengal and sowing be continued for more than a month so as to take advantage of the first break of the monsoon. Fertilisers of proved value on cotton must not be overlooked by ambitious farmers; 200 lbs. of Superphosphate and 80 lbs. Sulphate of Potash per acre drilled in at the time of sowing to be followed by a top-dressing of Nitrate of Soda at 130 lbs. per acre in two doses. The first dose should be given when the plants are about 3 inches high and the next when they are about 5 inches in height. Such an application will have a marked result in increasing the outturn of cotton.

Pineapples should be manured twice yearly, the first application should be given after the fruits are gathered and the next immediately before the flower head forms. A mixture consisting of 125 lbs. of Cotton Seed Meal, 200 lbs. of Nitrate of Soda, 40 lbs. of Sulphate of Potash and 125 lbs. of Steam Bone Meal should be applied per acre after harvest. Besides this, another mixture consisting of 50 lbs. of Nitrate of Soda 120 lbs. of Superphosphate and 125 lbs. of Sulphate of Potash should be applied before fruiting.

For an increased and profitable outturn of orange a mixture consisting of 34 lbs. of Nitrate of Soda 40 lbs. of Potash Sulphate and 56 lbs. of Super-

phosphate will be applied in June and November before the new growth starts.

Papya and plantains should be manured in early June by the use of a mixture consisting of 200 lbs. of castorcake, 150 lbs. of Nitrate of Soda, 150 lbs. of Bonemeal and 100 lbs. of Wood-ash applied in the same way as for orange. This quantity may be divided equally according to the number of plants to an acre.

The gardens should well manure flower gardens and provide abundant supply of water as both are equally essential. Otherwise flowers cannot thrive properly. A mixture consisting of 1 part of Nitrate of Soda, 1 part of Bonemeal and 1 part of Muriate of Potash or 3 parts Wood-ash is recommended for the soil in which season flowers grow. This should be applied before sowing or planting at the rate of 2 or 3 oz. of the mixture per square yard.

AGRICULTURAL OPERATIONS FOR JULY

FOR THE PLANES

Vegetables.—During this month sowings of most native vegetables such as brinjal, ochra, pulwuls, cucumbers and the different kinds of runner beans and gourd may be continued. Seeds of cabbage, cauliflower, beet, etc. may also now be sown as soon as the rains set in. Arrowroot, ginger, turmeric, artichoke will require earthing up about this time.

Fruits.—The crowns of pine-apples of a fine kind, when wrenched off, should not be thrown away but inserted in pots of sand under shelter. If watered regularly, they will soon form beautiful healthy plants.

This is the best time for budding peaches, plums and trees of the orange and lemon tribe in Bengal (Lower). Indian sorrel and cape gooseberry may be sown at this period.

Flower.—The budding of roses in Lower Bengal might now be attempted. This is the most successful season for striking cuttings of all soft and hardwooded tropical plants which can be propagated in that way such as Hibiscus, Coleus, etc. Cuttings also of China Roses will strike at this period.

FOR THE HILLS

Vegetables.—The rains will have set in now and any seeds sown during this and the following months. must be kept under shelter to protect them from the heavy rain. Successive sowings of most vegetables may be made.

Fruit.—Apples, pears and apricots will now be ripening and should be protected against depredations of all sorts. At the end of this month sow seeds of the hill apricots for a stock of plants to graft some of the superior English varieties upon.

Flowers.—Dahlias will now be flowering and occasional applications of liquid manure will have a very good effect upon them and Hydrangeas. Hanging baskets filled now with wild ferns, and other cultivated varieties of Adiantums, Davallias, etc. with a Begonia in the centre will have a very fine effct in the green house. The cuttings put down in April and May will now be well-established and should be potted off in three and four-inch pots in good rich soil, and plenty of drainage. The green house must be examined every day for insect pest. The temperature within should be kept as equable as possible.

Scientific Researches and Inventions

NEW METHOD FOR USE OF SOLAR ENERY

Two American scientists have worked out a new method for using the energy of the sun which may ultimately produce electrical power.

The technique, developed at the Massachusetts Institute of Technology, involves the chemical breakdown of water into hydrogen and oxygen by the sun's rays and later the burning of the two gases to produce heat. The process is described in the current issue of 'Science', a journal of the American Association for the Advancement of Science.

The process is still in the experimental stage and is very inefficient, but experiments indicate future of a sun-activated chemical system for making electric power.

Dr. Lawrence J. Heidt, associate professor of chemistry, who collaborated with Dr. Alan F. McMillan on the project, emphasizes, however, that utilization of solar energy by this method is "not just around the corner."

Key to the process is cerium, a rare earth metal which exists in two forms when in a water solution. Under the influence of sunlight cerium changes from one form to another and back again. In the process, the water is broken down into its component elements — hydrogen and oxygen.

At present very little gas is made this way, but Dr. Heidt says that it is theoretically possible to step up the reaction to produce large quantities of the gas without heating.

Since the gases are made they can be recombined by burning, the hydrogen feeds on the oxygen, and the heat of the combination can be used to run an engine which could power a generator.

Other chemical reactions activated by light are well-known, but the cerium reaction is the only one that makes it possible to remove the products of the reaction for storage. The same thing is done biologically by plants, but their photosynthetic process is a secret.

SUPERSONIC WAVES TO EXTINGUISH FIRE

"The fireman of the future will not have to worry about falling off a ladder or tripping over his hose. He will not have to freeze in the winter, Instead, he'ill be able to do his work much better than it's done now—and remain in the fire-station", so says Dale K. Auck, fire prevention expert for the U.S. Federation of Mutual Fire Insurance Companies and an authority on fire-fighting methods. Auck believes that the fireman of to-morrow will put fires by beaming high frequency sound waves at them. The use of water and other present methods will be discarded. "In a laboratory", he says, "you can bend or diminish the flame of a Bunsen burner by bouncing sound waves against it. There's no reason why the same thing couldn't be down with bigger blazes as our knowledge of sound increases". According to Auck, fire station of the future would consist of a large self-powered generator. This would have a dish-shaped antenna, similar to a ader search screen. When fire broke out, the firemen would send out supersonic frequencies which would put out the fire. Besides large-scale models, smaller sound generators might also be developed. These would be installed in buildings just like present-day sprinkler systems. "We're still using the same old fire extinguishing agent—water—that we've been using for ages". Auck says, "All we've done is to improve its application technique.' It's time that we looked for a better agent, and sound waves may be the answer".

CELLS WITHOUT OXYGEN

For the first time in medical history, normal cells growing in tissue cultures outside the body were transformed without use of cancer-inducing chemicals into cancer cells. The findings, which made a significant contribution and pave the way to new cancer research, were published in a recent issue of the Journal of Experimental Medicine by Dr. Harry Goldblatt, Medical Scientist of the Cedars of Lebanon Hospital, Los Angeles and his assistant, Gladys Cameron. According to a report in *New Week* Goldblat's study was based on work done in 1923 by Dr. Otto Warburg, Nobel Prize winner, who determined that cancer tissue had a metabolism, or chemical process of subsistence, different from normal tissue. Warburg showed that, unlike normal cells, which depend on oxygen for growth, malignant tissues can thrive without oxygen Dr. Goldblatt and Miss Cameron worked on the theory that normal tissues might undergo malignant change if intermittently deprived of oxygen. This was accomplished after two and one half years of painstaking work, by repeatedly exposing the normal tissue to an atmosphere of inert nitrogen, and, in the end, the cells of the tissue turned into the kind of cells that do not need oxygen — cancer cells. While Dr. Goldblatt does not claim that lack of oxygen in tissues is the cause of human cancer, he does point out that cancer in man often arises in scars, chronic ulcers, and in parts of organs in which a poor blood supply, and therefore of oxygen, might have existed for a long time.

IS SPACE REALLY EMPTY?

The possibility that the great galaxies, or island universe of stars spread out and run together, leaving no space between them that is really empty is suggested by Fritz Zwicky, california Institute of Technology astrophysicist. In an article in *Physics Today*, Dr Zwicky points out that the tidal effects of one galaxy on the material making up another has long been noted, and that the formation of the spiral arms that make up the outer reaches of many of these vast universe has been attribued to these tidal waves. This view of the formation of the sprial arms is supported by the existence of many double galaxies, more or less widely separated, that are connected by one or two special arms. Dr. Zwicky points out these connective spirals seem to have a cohesive or sticky structure that the great stellar syetems, according to conventional theories, are not supposed to possess. This would make the present theory that great star systems colliding head-on would pass right through each other with very little disturbance, unjustified. The structure of some of these interconnected galaxies seems to thin out indefinitely. suggesting the possibility that the galaxies have no real boundaries at all, but spread out until they meet the matter of another galaxy, leaving no unoccupied space between them.

NEW FUEL

According to a report tests are being made in Pennsylvania and Colorado for the creation of a new fuel from low-temperature distillation of coal. The new fuel, called "char," reportedly could have revolutionary effects in the production of iron and steel, various metals and electric power. The Colorado experimental plant, it is reported, has been developed from designs of Daniel Petit, a French engineer.

Engineering Notes

Manufacturers and Suppliers are invited to give notice in this paper of new products or developments. Description should be brief and blocks or stereos not more than 2½" wide, 85 screen for halftones.

PRINTING WITHOUT METAL

In the near future the first book will be published in America by a printing process that involves no metal type. The process is known by the name of Photon, and is the invention of two French telephone engineers, Louis Moyroud and Rene A. Higonnet. It has been devoted in the United States by the Graphic Arts Research Foundation, a non-profit organisation. The first publisher to use it is Rinehart and Co., Inc.

Photon is an electronic method of typesetting that uses film negatives instead of metal type. Before its development photographic processes have been in common use every where to make impression on the paper of a book, but the original from which a negative is made for printing has had to be typeset.

In Photon each character recorded by an ordinary typewriter is coded and stored in a "memory" unit, like those in electronic computers. The control factor in the electronic device spaces out the letters in a line and a photographic unit records the line on a sheet of film. The final product is a complete film negative of each page as it will look in the book.

In publishing the first Rinehart book, The Wonderful World of Insects, the equipment was run by an unskilled operator to record at the rate of 12,000 characters an hour. The publisher claims that this is two to three times the speed of a standard typesetting machine.

The Graphic Arts Research Foundation which is backing the maker of the new equipment, Photon, Inc., of Cambridge, Mass. has been financed by U.S. newspaper and book publishers. Photon has also put up money. The company has ten production models in the works. It has been noted that the U.S. developed process has a competitor in the device of the British Monotype Corporation Ltd., which plans to add a photographic unit to monotype machines.

FLOURESCENT CHALK

American Crayon Company, of Sandusky, Ohio has developed a line of flourescent chalks that can be activated by black and blue light. Known as "Hi Glo", they come in orange, yellow, violet and other bright colours. They enable lectures to illustrate talks delivered in darkness when allied with film or similar material.

SAFETY BOOT TOE-CAP

Industrial safety boots made to the specification of a new British Standard recently underwent a spectacular test in London. Watched by a large crowd, Mr. George Denton, head of one of the 40 British firms engaged in the manufacture of safety footwear, deliberately placed the toe of one of the boots he was wearing under the wheel of a London Transport double-decker bus. The bus then passed slowly and completely over it. A moment later Mr. Donton withdrew his foot unharmed. Another make of safety boots also made to the British Standards specification will be subjected to a new test soon when they are tried out in the exacting conditions of the desert by a British expedition to the Sahara.

The main feature of the specification (which took 18 months to design and has been drawn up by the British Standards Institution in co-operation with the footwear industry) is a steel toe-cap weighing only 2oz—no more than an egg—yet capable of withstanding a deadweight of three tons, or the equivaleit of a 60 lb. weight dropped from a height of 2½ft. The new footwear is expected to reduce number of accidents to feet in industry by approximately 95 per cent.

PLYWOOD ADHESIVE FROM CASHEWNUT LIQUID

A satisfactory thermosetting plywood adhesive composition from cashewnut shell liquid has been developed at the Forest Research Institute, Dehra Dun. Commercial Cashewnut shell liquid with 10 per cent phenol added was condensed with 89 per cent formalin in presence of 2.5 parts of liq. ammonia at 60°-70°C 4 hr. The resin which exhibits no adhesion to wood, develops the property when a suitable hardener—calcium hydroxide, copper chloride, activated charcoal or copper carbonate (5 per cent on the weight of the resin)—is added to a solution of the resin in trichloroethylene. The adhesive requires longer curing time than phenol formaldehyde adhesives. (Indian forest leaflet No. 128, 1952).

100 MPH WIND TUNNEL WILL TEST RAILWAY EQUIPMENT

British Raliways are to build a new 100 mph wind-tunnel testing plant at Derby to provide data for the design of locomotives, carriages, wagons and railway structures. Announcing this recently, British Railways said that among subjects to be studied will be improved train ventilation, dispersal of smoke and steam; wind resistance of wagons used in high-speed freight trains; design of draught-proof signal lamps; extraction of smoke from engine sheds; and cooling of Diesel locomotives.

The tunnel, which will be located in a separate buliding close to the railway research laboratory, will be operated by a 50hp motor. It will be planned on the return-flow system, which enables the unexpended velocity of air as it returns to be used.

VINYL FLOOR MATS

Colourful and durable new Vinyloom floor mats to protect and brighten floors in every room of the house are being made by Vinyl Linens, Inc., New York, N.Y. The mats are made of Vinylite plastic moulded with deep, springy carpet textures. In addition to being skid resistant the mats are easily cleaned and are resistant to water, soaps, detergents, oils, grease. foods, scudding, tearing, and cracking, it is said. They are also suitable for use as door mats and throw rugs in beach cabanas, bath houses, and boats.

There-dimensional moulding by the Forrest Process reproduces exactly the fine texture of hooked, rope. and braided rug patterns. Choice of 12 decorator colours permits matching the rugs with bath towels, upholstery, walls, linoleum, or other room decorations. Available colours include willow green, taffy blue, cherry, gardenia white, carnation pink, pewter gray, citron yellow, flame red, pebble beige, hunter green, chartreuse, and black. The mats are made in nine patterns and in three sizes, which are as follows: 18 by 25, 24 by 36, and 25 by 41 inches.

BRITISH SCIENTISTS DEVELOP ELECTRONIC SPINNING MULE

An important step has been taken in the evolution of textile spinning machinery with the development of an electronic

spinning mule by research workers at the University of Leeds. Little or no important change has been made in the basic design of the spinning mule for nearly a century, but recent discoveries have made it possible to design and build a practical machine which controls the essential movements of the mule by electronic means.

Research workers designed and built the electronic spinning mule mainly to assist them in the various aspects of spinning research rather than to develop a completely new machine for commercial use. Results were so encouraging, however, that the heads of textile organisations and trade associations expressed their approval and a large-scale model is now being built by a textile machinery firm for trial in a Yorkshire mill.

The planning and building of the machine represents three years of work by a team of experts at the university, led by Dr. N.H. Chamberlain, senior lecturer in rayon technology.

TIPPER TRUCK FOR BULK GRAIN TRANSPORT

A tipper truck for the bulk transportation of grain from farm to mill has been produced by a British firm. The vehicle holds seven tons of grain, which is loaded through the open top and emptied by tipping direct onto conveyors which convey it storage bins. The tare of the vehicle, on a Bedford short-wheelbase chassis, is now enough for it to be registered in the 30-mph class, making it economical i operation. This has been achieved b constructing the body in light alloys.

Normally grain is discharged through a trap which is manually adjusted to control the rate of flow accurately in conjunction with conveyor speed. But for speedier empting the lower half of the rear end—which is hinged—can be dropped like the tailboard of a truck. If need arises to load sacks, a pair of vertically hinged doors above the drop board can be swung back for easy access.

ACCURATE COAL SAMPLER

Accurate coal sampling is a high-priority need in power stations. To meet this a British firm has developed a coal sampler which, it is claimed, is a simple, robust and easily maintained unit with dimensions least likely to affect any plant layout. It can be applied readily to now and existing belt conveyor installations.

It comprises a hinged scraper arm operated by a thruster through link mechanism, carrying the scraper across the width of the belt, thus removing a cross-section of the fuel and delivering it into a side chute for inspection. The lower section of the scraper arm is hinged and spring-loaded so that, during the return action of the arm, the scraper rides over the material without disturbing it. Extensive tests with a unit installed for full duty have proved that the samples conform to the limits of accuracy recommended by the British Standards Institution.

INDO-TURKISH TRADES

India recently signed a trade agreement with Turkey with a view to promoting trade between the two countries. The main items of export from India at the present moment include coir yarn and manufactures, drugs and medicines, dyeing and tanning substances, papper, tea, jute yarn and manufactures, and lac. The main items of import from Turkey include chemicals and dry fruits. Under the recently signed agreement the scope and volume of trade between India and Turkey are expected to increase. Facilities will be provided in the matter of issuing export and import licences and both countries will do their utmost for expandnig trade in the articles listed in the schedule. India has agreed to import from Turkey dried fruits, coarse grains and pulses, millets, chick-peas, textiles, beans, silk yarn and silk cocoons, raw cotton, quick silver, carnuba wax, acorn and acorn extract (a tanning material). The list of exports from here to Turkey includes tea, jute goods, hassians, jute bags, coir yarn, motor tyres and tubes except giant tyres, rubber goods, medical instruments, spices, medical castor oil, nutmegs and cotton goods.

PAKISTAN JUTE

Raw cotton and jute are the two principal cash crops of Pakistan and even though her trade in jute has fallen on evil days necessitating conversion of land under jute cultivation to paddy growing, her jute exports during the season ending June, 1953, are reported to have been quite satisfactory, according to a recent Government press release.

During the aforesaid period the total sales of jute were in the vicinity of 6,700,000 bales of which about 5,300,000 bales were exported upto June 30. The total value of exports in 1952-53 amounted to Rs.57 crores. The earnings from jute have declined considerably, being about Rs. 99 crores against export of 4.8 million bales during 1951-52 season. The decline is attributed to low prices of jute prevailing in the 1952-53 season.

The official publication makes the following points:—

During the first 11 months of the 1952-53 season, India imported about 1.3 million bales while the U. K.'s imports during the same period amounted to about 800,000 bales. In the previous season (1951-52), India imported 1.6 million bales while the U.K. obtained only 500,000 bales. This shows that during the 1952-53 season, India bought less jute from Pakistan while the U. K.'s purchases improved.

The survey further reveals that Pakistan's jute exports dollar countries, which totalled only 171,043 bales in 1951-52, improved to 533,868 bales during the first 11 months of 1952-53.

In regard to carryover stocks the survey points out that out of the total exportable surplus of 8.1 million bales (production plus carryover from 1951-52 season) Pakistan had exported 5.3 million bales. This will leave a carryover of 2.8 million bales.

The survey forecasts optimistic trends in jute trade during 1953-54. Limited jute production combined with prospects of firm prices are expected to bring large earnings of foreign exchange during 1953-54. The acreage for the 1953-54 crop in Pakistan has been so fixed as to yield a limited quantity of jute which, according to provisional estimates, is not expected to exceed 4.2 million bales. Preliminary estimates about the size of the crop do not, however, exceed 35,00,000

bales. Even if this estimate is provisionally accepted, the total available supply of jute in Pakistan during the 1953-54 season will be about 6.3 million bales (3.5 million bales plus 2.8 million bales), says the survey.

The total world supply of jute during the 1953-54 season will be about 9.3 million bales against the normal world demand of 10 million. Both supply and demand will thus be well balanced, the survey concludes.

SINGHALESE NEWS

The Government of Ceylon has imposed further restrictions on imports and relaxed her export policy. Among the imported articles, the luxury goods are everywhere counted as a privilege of the rich and so the common people of the island are likely to react favourably to the raising of import duties on them. These articles include building materials, cigarettes, pipe tobacco, brandy, tinned foodstuffs, jewellery, confectionery, perfumes, electrical goods and eggs. Obviously, some of the above articles are yet to go down as a luxury in the fast deteriorating economy of India and it will give some relief to our oppressed minds to reflect on the fact that economic backwardness is not peculiar to our country. Our Asian neighbours share it to a considerable extent.

Among the items of a different type which must have to scale the barrier of increased import duties before they might make their way into Ceylonese market, special, mention should be made of cotton piece-goods, yarn, natural silk, woollen and worsted materials, carpets and timber. Some of these items figure prominently in India's export trade.

Ceylon has halved the export duties on cardamom, which is her principal item of trade with the oversea countries and reduced that on whole pepper from Rs. 250 to Rs. 150 for every 100 lbs. The measure is meant to boost up their exports.

The new Budget contains certain fresh taxation proposals. Taxes on resident and non-resident companies have been raised from 30 per cent. and 36 per cent. to 34 per cent and 40 per cent. respectively. Tax relief has been accorded to civil expenditure on productive undertakings. On the basis of the new rates of tax, says a recent report, a company which spends Rs. 1,00,000 in any one year for opening up and planting of uncultivated land, will get a reduction of Rs. 34,000. An individual who spends a similar amount will get a reduction of Rs. 85,000. Ceylon's principal industries being plantations, these measures to give a fillip to their development will be judged as a step in the right direction.

SINO-BRITISH TRADE

An unofficial British trade delegation recently came to Peking. As a result of its efforts to promote Britain's trade with Communist China, an agreement has been recently signed by the delegation and the Chinese National Import and Export Corporation, both being parties to it. The agreement provides for trade amounting to £ 30 million each way. Payments are to be made in sterling. Under the new agreement, British businessmen will supply China with metal and metal products, machinery, electrical appliances, chemical materials, tools and instrument, medical and surgical equipment, communications and transport equipment, and other goods worth £ 30 million. In return, China will sell to Britain vegetable oil, oilseeds, animal products, tea, silk, handicraft products, and other goods worth the same amount. The mission was organised by the British council for the promotion of international trade. The provision of export of gools to China will, it is said, be subject to British Government export licensing.

IMPORT OF AUTOMOBILE SPARE PARTS

Through a notification published in a Gazette of India Extraordinary, the Government of India has sought to remove doubts about the lincesing policy for imports of automoble spare parts. The notification reiterates the Government of India's desire to give liberal facilities for imports of automobile spares. It says:

"The licensing policy for the import of motor vehicle parts falling under serial Nos. 293, 295 and 297 of Part IV of the Import Trade Control Schedule for January-June, 1953, has been published in Appendix "ZA" of the relevant Red Book and for July-December, 1953, in Appendix "P" of the current Red Book. The policy and procedure has been designed to facilitate liberal imports of automobile spares through all possible channels, namely, established importers, recognised assemblers, fleet owenrs, workshops owners and spare parts merchants.

"Apart from the issue of quota licences to established importers, and newcomer licences to dealers in spare parts, provision has been made, in paragraph 7 of Appendix "ZA" and paragraph 6 of Appendix "P," for the grant of special licences to "persons who had been dealing in spare parts of motor vehicles in the past and were obtaining their supplies through assemblers and stabilished importers, provided they are prepared to invest a substantial sum for importing automobile parts." In this connection, doubts have been expressed in some quarters as to whether established importers who find their established quotas inadequate or who have felt obliged in the past to obtain a portion of their requirements from recognised assemblers and other established importers are also eligible to apply for these special licences. These doubts are unfounded, for it has been the Government's intention throughout to grant reasonably liberal facilities for imports of automobile spares to all those (i) who are able to invest substantial sums of money and (ii) who had, in the past, been obtaining a portion or the whole of their requirements directly from assemblers and other established importers. Persons and firms, whether established importers or dealers in spare parts, or workshops owners, who fulfil these two conditions are eligible to apply for these special licences."

NEW INDUSTRIES IN ORISSA

The Orissa Government proposes to establish seven new industries including paper, aluminium, ferro-manganese, and spinning and weaving mills, in the State within the next two years. Besides, the Government has obtained sanction from the Centre for the setting up of one jute and two sugar mills.

GRADING MICA FOR EXPORT

A suggestion for creating a central organisation for taking over operation in regard to mica is under the examination of the Government of India. The Government has been advised that the quality of mica for export should be improved by adopting a universal standard for grading. Action is being taken in this direction.

ELECTRONICS AND TELE-COMMUNICATION FACTORY AT BANGALORE

The total outlay involved in the setting up of the proposed electronics and telecommunications factory at Bangalore is estimated at Rs. 7 crores. A contract has been entered into between the Government of India, and the French firm, Campagine Generale de Telegraphic Sen Fil. Under the contract, a sum of Rs. 7 lakhs is to be

paid to the French firm for the services rendered in connection with the drawing up of the plan and details for the building and construction of the factory, of Rs. 40 lakhs for the construction and services directly connected with the purchase and installation of plant and machinery, and of Rs. 40 lakhs as payment for technical advice and assistance. The payment in the nature of royalty on actual production will be on a percentage basis, such being 3 per cent. on the first crore worth of goods, 2 per cent. on Rs. 2 crores, and 1 per cent. on Rs. 3 crores and above.

EXEMPTION OF CUSTOM DUTY ON REIMPORTATION OF MACHINERY

The Government of India has decided to consider on an ad hoc basis the grant, in genuine cases, of some relief in customs duty on reimportation of machinery exported out of India for repairs, provided that no drawback of duty is admissible at the time of export. To qualify for exemtion, it is necessary for a certificate to be obtained, before export, of the machinery from the Development Wing of the Ministry of Commerce and Industry, after inspection by officers of that Department, if necessary, to the effect that the repairs to be done to the machinery are such as cannot be carried out within the conutry. It will thereafter be open to the Govenment at its discretion to grant on re-importation exemption from so much of the customs duty as is in excess of that leviable on the cost of repairs, freight and insurance charges both ways. The Customs Collector should, however, be satisfied as to the identity of the goods. The ownership of it must remain unchanged and re-importation should be made within one year of the export.

NEW PERMIT PROCEDURE FOR CLOTH AND YARN TRANSPORTS

By a notification published in the Gazette of India the Textile Commissioner has revised the form of application for the issue of special transport permits in respect of movements of cloth and yarn. Under the revised form, it is no longer necessary for applicants to indicate the Texmark number and the month of packing of the materials sought to be transported, nor is it necessary to get the countersignature of the carrier on the special transport pemits, in the case of movements by rail or steamer, or that of the police officer, etc. at the destination, in the case of movements by other means of transport.

The applicant, however, is required to make, in addition to the usual declarations, a declaration that the bales are not time-barred under the Cotton Textiles (Control) Order, 1948. He is also required to enter, in the copy of the special tranport permit to be returned to the office of the Textile Commissioner, all the particulars of the transport including the quantity despatched in each consignment and the R. R. No., date thereof.

PROBLEMS FACING SOAP INDUSTRY

The problems facing the Indian soap manufacturers were discussed by Sri S. C. Ghose in his presidential address to the 19th annual session of the Indian 'Soap and Toiletries Makers' Association at Bombay.

The distressed conditions of the industry, he said, had arisen, in a great measure, from the cumulative effect of a series of factors, the most important among which were (1) the partition and the consequent loss of thriving markets which were now export markets, (2) the fall in local consumption at the end of the war due to the cessation of defence requirements together with the fall in the purchasing power of the people, (3) the uneconomic prices of raw materials like oils, leading to the further curtailment of production through decline in sales and (4) the unbalance that was in the industry itself.

No doubt, he said, all the units of the industry were, more or less, affected by the first three factors, but their incidence was much greater on the indigenous units than on the foreign combine operating in the line. The most serious problem now facing the Indian manufacturers lay in the fact that the industry was extremely unbalanced at the moment. A considerable part of its existing capacity had remained idle, and the problem of how to bring it into use had proved to be the cause for severe concern to the Indian manufacturers. Barely 30% of the industrial capacity was now being utilised. This did not however, mean, that all the units of soap factories operating in the country were confronted with this problem. The foreign combine with their vastly-superior capital and control over enormous resources were not in the least affected by this problem as they were working almost to the full extent of their capacity.

The combine, Sj Ghose continued, were trying to obtain Government of India's sanction to their re-organisation scheme under which they proposed to import a new machinery worth Rs. 27 lakhs for manufacturing soaps by replacing the existing plant at Bombay. He felt that in the national interest, and more particularly, in the wider interests of the industry, there was not the least economic justification for the proposed re-organisation.

If Government were really anxious 'to let us live', it was indispensably necessary that the proposed importation of the new plant by the Combine must not only be stopped, but the production of soap in the country must be so regulated as would enable the idle part of the existing capacity to be utilised to the maximum possible extent. The Indian soap manufacturers in general were now threatened, Sj. Ghosh said, with the prospects of closing down their factories due primarily to their inability to stand in competition with the products of the Combine solely because of the latter's "inherently powerful position derived from the ownership and control over huge capital and world-wide resources".

Discussing other problems of the industry the President suggested that apart from giving necessary assistance in the procurement of raw materials, Government should give refund of import duty on coconut oil, caustic soda, essential oils, and packing materials used in the manufacture of toilet soaps which were exported abroad. Besides, Government should provide for export of soaps in any bilateral trade agreement that might, from

time to time, be concluded with foreign Governments, and ensure that other contracting Governments actually imported soaps from India.

ENGINEERING INDUSTRIES OF INDIA

The following are extracts from the presidential speech of Mr. P. R. Bagri at the tenth annual general meeting of the Association.

"The Planning Commission have laid down targets for production for various engineering industries, and, I have hopes that the productive potential fixed by the Commission is capable of achievement. I am, however, extremely doubtful whether the maximum utilization of that productive potential would be feasible in the context of the trade recession which has set in beyond any shade of doubt. There are many industries, chief mention among which can be made, of the pumps, diesel engines and automobile industries, where the targets of production have been fixed but, where on account of the slackening of demand, it is a formidable task for the manufacturers even now to dispose of their present production.

"The need for steps to reduce costs of production is paramount at all times: but at a time of falling demand, such as we are experiencing now in many of our engineering industries, the need for this cannot be overemphasized. On the cost of raw material and stores, there is very little that we can hope to save unless other industries co-operate and with the return on capital already cut to the barest minimum, it is only in the fields of administration, plant efficiency, and labour productivity, that we can hope to make substantial gains for the benefit of the consumer. The visit of the I.L.O. team of experts on productivity studies and systems of payments by results, has not, therefore, come a day too early; and, we welcome these experts to our country. In an age of continuous technological improvements the effective life of plant and machinery has been rather shortened; and Government can help the campaign for cost reduction by making it possible for industries to renovate their plant by appropriate depreciation allowances. The rates of depreciation allowances, which were conceived 30 years ago, inadequate in present-day circumstances and need to be revised very urgently.

"With prices tending to fall and customer resistance for price and quality fast gaining ground, a reorientation of labour's attitude to industry and industry's attitude to labour is called for in the mutual interests of both. Industry must help labour achieve greater efficiency by providing better plant and technique, and labour, on the other hand, has to be prepared to give a full day's work for a fullday's wage. Only in this way can goods be made available to consumers at cheaper prices and continued employment of labour and capital fully ensured; failing this, large-scale unemployment of labour and capital does not look like a distant possibility. Misguided labour movement at this stage and over-enthusiastic labour legislation is fraught with dangerous possibilities.

Kumardhubi Engineering Works, Ltd

The directors of the above Company (Managing Agents: — Messrs. Bird & Co., Ltd., Calcutta) submit the audited accounts of the Company for the year ended 30th November, 1952.

The profit and loss account, including Rs. 34,385 (Rs. 42,750) brought forward from the previous year and Rs. 35,507 (*nil*) for dividends forfeited, and after allowing for sundry charges, depreciation, taxation, etc., placing Rs. 25,000 (Rs. 30,000) to tax contingency reserve, shows a credit balance of Rs. 3,14,533 (Rs. 3,49,385) which the directors propose to dispose of as follows:—

In paying a dividend on the preference shares at the rate of 5 (5) per cent. per annum without any deduction for income-tax paid by the Company Rs. 60,000 (Rs. 60,000), in paying a dividend on the ordinary shares at As. 7 (As. 8) per share without any deduction for income-tax paid by the Company Rs. 2,23,125 (Rs. 2,55,000) and in carrying forward Rs. 31,408 (Rs. 34,385).

The capacity of the works has been fairly well utilised throughout the year despite the continued shortage of steel, particularly steel plates.

The reduction in profits is mainly due to the lack of orders for steel wagon castings: in consequence the directors were unable to effect despatches within the financial year, but these should be reflected in the accounts for the follwing year. Orders have since been received and the position has improved.

The directors have decided to increase the foundry capacity by the installation of an electric furnace together with an increase in the moulding shop floor space.

It is hoped that Government's announced intention to feed ordnance factories with orders at the expense of private enterprise will not be carried out. This would not only be detrimental to the Company's order position, but the country's industrial strength would in the long run be undermined.

Britannia Biscuit Co., Ltd

The directors of the above Company (Secretary: Mr. A. P. Chanda, Calcutta) submit the audited accounts of the Company for the year ended 31st March, 1953.

After providing Rs. 4,20,184 (Rs. 1,69,872) for depreciation and reserving for income-tax Rs. 20,000 (Rs. 4,547) the profit and loss account shows a net profit for the year of Rs. 1,18,326 (Rs. 9,01,648). To this must be added the amount brought forward from the last balance-sheet of Rs. 1,82,277 (Rs. 2,19,056) making a total of Rs. 3,00,603 (Rs. 11,20,704). The directors have transferred to reserve for income-tax contingencies the sum of Rs. 50,000 (Rs. 5,00,000) and paid halfyearly dividend on preference shares absorbing Rs. 618 (Rs. 618) leaving a balance of Rs. 2,49,985 (Rs. 3,16,975 after paying 3⅛ per cent. interimdividend Rs. 95,771). The directors recommend that the above balance at the credit of the profit and loss account be dealt with as follows:—

To payment of a dividend on preference shares Rs. 618 (Rs. 618), payment of a dividend of 5 (4⅜) per cent. on ordinary shares Rs. 1,53,234 (Rs. 1,34,080) and to carry forward to the current year's account Rs. 96,133 (Rs. 1,82,277).

The period under review has been a more difficult one than the directors have experienced for a very considerable time.

The trade recession which set in, in the later part of the year 1951, continued throughout the Company's trading year and particularly affected retail business upon which the Company relies for the distribution of its products, and had the effect of considerably reducing the volume of sales as compared with the previous year, although it is reassuring to be able to report that sales from the Company's new Calcutta factory actually increased, the main reduction in business being experienced in markets supplied by its Bombay branch factory.

Unfortunately, the general trade recession had little or no reducing effect on the cost of the main materials and ingredients used in biscuit manufacture. flour, the main ingredient purchased by the Company and made available either directly or indirectly through Government sources, increased in cost by approximately 22 per cent. As the result of Tribunal awards, the cost of labour also tended to increase throughout the year under review, to which was added the difficulty in dispensing with the services of labour rendered surplus by the reduction in the quantum of production. In spite of these increased costs no increase in the price of the Company's goods to the public has been made.

During the year the Company's capital expenditure plan for the rehabilitation and extension of its factories and replacement of plant was completed. The new and modern plant mentioned in the last report is now installed and at the date of this report is in production. It is anticipated that a further improvement in the quality of the goods and a reduction in the cost of their production will be achieved and is, in fact, already apparent.

Saugor Electricity Supply Co., Ltd.

The directors of the above Company (Managing Agents: Messrs. Martin Burn Ltd., Calcutta) submit the audited accounts of the Company for the half-year ended 31st December, 1952.

Notification has been received from the Madhya Pradesh Electricity Board that it is prepared to grant the Company a loan to erect a thermal generating station and the work will be taken in hand as soon as formalities have been completed.

The following table shows the progress that has been made during the past three years, which has been on a restricted basis due to the insufficiency of the capacity of the generating plant.

Half-year ended	Units sold.	Revenue Rs.
30th June, 1950	481,226	1,43,181
31st December, 1950	472,382	1,41,994
30th June, 1951	552,147	1,66,645
31st December, 1951	578,197	1,73,221
30th June, 1952	614,313	1,85,801
31st December, 1952	586,692	1,91,828

After complying with the provisions of the Electricity (Supply) Act, 1948. and making adequate provision for liabilities and setting aside Rs. 6,000 (*nil*) to development and extensions account, there remains a balance of Rs. 10749 (Rs. 10,214) including Rs. 2,755 (Rs. 2,747) brought forward from the previous half-year available for distribution and this the directors recommend, be disposed of in paying of a dividend at the rate of 5 (5) per cent. per annum free of income-tax absorbing Rs. 7,500 (Rs. 7,500) and in carrying forward to next half-year Rs. 3,249 (Rs. 2,714).

QUEEN BALM LINIMENT

Camphor	2	oz.
Myrrh	2	„
Guaiacum	1	„
Capsicum	2	„
Sassafras oil	1	„
Hemlock oil	1	„
Alcohol, 90 per cent	128	„

Macerate with occasional agitation for 7 days, then filter.

Apply freely to the affected parts by means of flannel. This is very satisfactory for bruises, sprains, frostbites, and rheumatism.

SODIUM CITRATE

The official salt is the normal salt of citric acid and sodium, there being possible combinations owing to the trifold basicity of citric acid. It may be prepared by adding to a hot aqueous solution of 59 parts of citric acid an aqueous solution of 53 parts of sodium bicarbonate. The resulting mixture is next concentrated and set aside whereby crystals of sodium citrate are obtained.

SULPHUR OINTMENT

Precipitated chalk	10	grams.
Sublimed sulphur	15	„
Oil of cade	15	„
Soft soap	30	„
Lard	30	„

Melt the lard with the soft soap and oil of cade, then gradually incorporate the sublimed sulphur and precipitated chalk and rub the ointment until it is smooth.

CREAM FOR BURNS

Sulphanilamide	3	parts.
Glycerine	10	„
Groundnut oil	25	„
Lanette wax or beeswax	10	„
Water	52	„

Mix the first two and last three ingredients separately then mix together.

CHAULMOOGRA OINTMENT

Chaulmoogra oil	10	grams.
Hard paraffin	40	„
Soft paraffin, white	50	„

Melt the hard and soft paraffin, together; add the chaulmoogra oil; stir until cold.

AGNIMUKHA CHURNA

Asafoetida	1	part.
Acorus calamus	2	parts.
Long-pepper	3	„
Ginger	4	„
Ajowan	5	„
Chebulic myrobalan	6	„
Plumbago root (Chitramula)	7	„

Reduce the ingredients into powder form and pass through a cloth.

Dose: 20 to 40 grains with whey.

DANDRUFF CURE

Salicylic acid	6	dr.
Castor oil	90	tolas.
Lavender oil	2	oz.
Bergamot oil	1	„
Industrial spirit	2½	gallons.

Mix the liquids and dissolve the acid in the mixture. Rub the scalp once or twice daily with this lotion.

DYSPEPSIA POWDER

Ajowan Seeds, powdered	1	oz.
Rock Salt	1	„
Asafoetida (Hing)	1	„
Myrobalans	1	„

Mix.

Dose: 10 to 20 grains.

FEMALE PILLS

Powdered aloes	100	gr.
Powdered myrrh	100	„
Compound extract of colocynth	200	„
Ferrous sulphate	50	„
Oil of pennyroyal	25	drops.

Mix and make into 100 pills.

FEVER MIXTURE

Quinine sulphate	½	dr.
Sulphuric acid (dill)	½	„
Syrup orange	1	oz.
Glycerine	4	dr.
Water to make	8	oz.

Dissolve the quinine in the acid and then add the other ingredients.

Adult dose: 1 ounce.

EYE LOTION

Boric acid	2	dr.
Zinc sulphate	10	gr.
Distilled witch hazel	2	oz.
Glycerin	½	„
Distilled water to make	20	„

ANTIPHLOGESTIC PASTE

Kaolin	505.0	grms.
Boric acid	45.0	"
Thymol	0.5	"
Methyl Salicylate	2.0	"
Oil of peppermint	0.5	"
Glycerine	387	"

Take kaolin and heat it to 110°C. to drive off all traces of moisture and then allow it to cool and reduce to fine powder. Now mix the kaolin with the boric acid, and then thoroughly incorporate the warm glycerine, which has in the meantime, been rendered anhydrous by heating it for a short time to 100°C. Finally add the thymol, dissolved in the methyl salicylate and oil of peppermint, and make into a homogeneous mass. Preserve it in air-tight containers.

This mixture possesses emollient and antiphlogestic properties and is therefore largely used to allay inflammation in the treatment of pneumonia, boils, carbuncles, etc. and in dermatological practice.

HAIR TONIC

Tincture of cantharidin	6	oz.
Quinine hydrochloric	1	"
Tincture of capsicum	2	"
Glycerin	3	"
Bay rum	6	gal.

Tincture of cudbear sufficient to colour.

INDIGESTON MIXTURE

Sodi bicarb	4	oz. 6 dr.
Bismuth carbonate	1	"
Magnesium carb	1½	"
Spt. ammon Co.	4½	"
Chlorodyne	1½	"
Aqua chloroform	30	"
Aqua menth pip. sufficient to produce	90	"

Mix.

INFLUENZA SMELLING SALTS

Oil of eucalyptus	1	oz.
Phenol	½	"
Strong solution of ammonia	1	"
Ammonium carbonate	4	"

Mix and put in well stoppered bottles.

LIQUID EXTRACT OF KALMEGH (I.P.L.)

Kalmegh	500	grams.
Oil of fennel	2	mililitres.
Oil of ajowan	2	"

Alcohol (90 p.c.) a sufficient quantity.

Boil the kalmegh with 1500 mililitres of distilled water for half an hour and strain. And further 1500 mililitres of distilled water, are boiled for half an hour, strain. Repeat the process until a total of 200 mililitres of the extract are collected. Mix and concentrate to 250 mililitres on the water bath. Dissolve the oil of ajowan and oil of fennel in 2000 mililitres of alcohol (90 p.c.), and add this alcoholic solution to the concentrated extract. Determine the content of andrographolide and add enough alcohol to produce a compound liquid extract of kalmegh of required strength.

Dose : 8 to 15 minims.

REMOVING PIMPLE MARKS

Borax	3	grams.
Potassium chlorate	120	"
Alcohol	30	"
Glycerine	60	"
Rose water	760	"

Mix and keep aside for a week in a stoppered bottle. Then strain through a cloth and put in phials.

POTASSIUM CITRATE

To prepare potassium citrate weigh out 216 grams. of citric acid and 100 grams. of potassium bicarbonate. Now dissolve the two separately in equal quantity of hot water and mix. The potassium of the bicarbonate unites with the citric acid to form the potassium citrate, and the carbon dioxide escapes producing effervescence.

When the effervescence has been ceased evaporate the solution to dryness on a water bath.

RHEUMATIC PAIN KILLER

Menthol	15	gr.
Chloroform	1	oz.
Oil of wintergreen	1	"
Camphorated oil	1	"

Dissolve the menthol in the chloroform, then add the oil of winter-green and then the camphorated oil.

DYSPEPSIA POWDER

Ajowan Seeds, powdered	1	oz.
Rock Salt	1	"
Asafoetida (Hing)	1	"
Myrobalans	1	"

Mix.

Dose : 10 to 20 grains.

SPLEEN POWDER

Ginger (Sunth)	10	grains.
Rhubarb (Raven Chem)	5	"
Ferri Sulph	2	"
Quinine	2	"

Mix and make one packet. This is for one dose.

CANVAS SHOE DRESSING

Zinc oxide	2	oz.
Pipe clay	4	„
Bleached shellac	3	„
Borax	1	„
Sugar	2	„
Glycerine	1	„
Boiling water	10	fl. oz.

Dissolve the borax in the boiling water, add the shellac. Continue the heat until the shellac is dissolved. Then remove from the fire, add sugar and glycerine; stir in the pipe clay and zinc oxide.

LIQUID DEPILATORY

Sodium sulphide	14	parts.
Glycerine	20	„
Water	160	„
Rectified spirit	4	„
Perfume	1	part.

Dissolve the sulphide in some of the water; add the glycerine and mix. Add the remainder of the water and finally the perfume, dissolved in the alcohol, mix well and filter. The strength of this depilatory can be increased by increasing the amount of sodium sulphide but in no case should it exceed 10 per cent.

HEEL-BALL

Carnauba wax	3	lbs.
Hard paraffin	1	lb.
Tallow	6	oz.
Ivory black	12	„
Powdered acacia	4	„
Powdered sugar candy	4	„

Melt the waxes and tallow, add the other ingredients previously mixed, continue the heat and stir until homogeneous, then pour into leaden moulds previously wetted.

JEWELLERS' ROUGE

Saturate a solution of sulphate of iron (green vitriol) with a solution of oxalic acid. Filter and dry the resulting precipitate of pale-yellow oxalate of iron; place it in an iron dish and expose it to a moderate heat, whereby the oxalic acid will be left. This is very fine and can be used for producing a very brilliant polish upon the finest jewellers' work.

LAUNDRY BLUE TABLETS

Ultramarine	6	oz.
Sodium carbonate	4	„
Glucose	1	„

Water a sufficient quantity.

Make a thick paste, roll into sheets and cut into tablets.

AUTHOGRAPHIC TRANSFER INK

This is used for writing upon plain paper with a pen, said writing later transferred to a litho stone or metal plate :—

Marseilles Soap	10	oz.
Acetic Acid	1	lb.
Glycerin	20	„
Water	100	„
Shellac	12	oz.
Tallow	10	„
Yellow Beeswax	12	„
Mastic	5	„
Asphaltum	4	„
Lampblack	3	„
Water	125	„

METAL POLISH FOR CHROMIUM OR SILVER

Orthodichlorbenzol	400	c.c.
Water	70	„
Strong Ammonia	1	„
Saturated Solution of Castile Soap	2	„
Levigated Alumina	35	gr.

If carefully made a stable emulsion results.

For brass or copper polish substitute precipitated chalk for levigated alumina. If a more abrasive polish is desired substitute kieselguhr for precipitated chalk.

PAPER WAXING

Paraffin Wax	33	parts by weight.
Silicate of Soda	4	„ „
Alum	2	„ „
Glue	1	„ „
Water	60	„ „

The silicate of soda used in the above formula is a commercial form of syrupy consistency containing about 50 % of water. This silicate of soda syrup is mixed with 65 % of the total water. The remaining 35 % of the total water is used to dissolve the alum. The glue is added to the diluted silicate of soda. The wax composition is prepared by first melting the wax, adding the silicate of soda solution containing the glue and agitating, finally adding the alum solution with agitation. The temperature at which the composition is prepared is about 170°F.

PEARL-GRINDING MACHINES

1577 P. L. D., Calcutta—Requests us to describe the process of grinding mother of pearl buttons.

Pearl button blanks are ground to the desired thickness on a machine technically termed a backing machine. It is equipped with a carbide-of-silicon wheel under which the work is carried by a horizontal canvas belt. The operator places the buttons on the belt by hand and they are discharged by gravity at the other end. Such machines are equipped with an exhaust hood for carrying away the dust.

Another machine called a rounding machine is used extensively. This machine is equipped with a number of chucks in which the operator places the buttons. The chucks rotate in a circular path and at a certain point in the cycle they are closed automatically. Then they are carried under the periphery of a grinding wheel. The chuck holding the button revolves so that a formed wheel generates the desired contour.

A so-called button-making machine is a complicated affair for performing several button making operations in sequence. In the operation of such a machine the blanks are placed, one at a time, in depressions in a feed plate. As this plate revolves the blanks pass under a carbide-of-silicon grinding wheel. From the feed plate the buttons pass to chucks that grip them automatically and feed them under turning tools. These tools are kept sharp constantly by an alumina wheel which grinds them automatically. The chucks with the buttons now pass to the drilling operation where small drills pierce the necessary holes. One hole usually is drilled at a time and when four are desired for drilling stations are passed in sequence, the button blank making a quarter turn between each. The chucks then unclamp automatically and the buttons are removed by air suction.

ROOF PAINT

1 F. L., Jullundur City—Wants formulas of roof paint.

I

a.	Stearin Pitch	30	lb.
	Pit-Coal Tar Pitch	30	„
	Asphaltum	20	„
	Rosin	20	„
b.	Mineral Oil		
c.	Slate, Powdered		
	Asbestos Powdered		

Melt up the mixture a and mix in b to the desired viscosity c may be added as filler. Solvents may be added if quick drying is desirable.

II

Pit-Coal Tar Pitch	10	kg.
Coumarine Resin	2	„
Benzine	4	„
Light Tar Oil	5	„

III

a.	Rosin, Medium Pale	30	kg.
	Anthracene Oil	20	„
	Gas Oil, or Heavy Benzine	12	„
b.	Earthy Pigment	35	„
	Clay-Schist Powder	15	„

Make solution a hot. and work in the powders b. A paste is obtained which will remain plastic in the cold.

IV

Stearine Pitch (Hard)	45	lb.
Stearine Pitch (Soft)	17	„
Wool Fat	5	„
Green Chromium Oxide	33	„

V

Gilsonite	25	lb.
Stearine Pitch (Medium Soft)	25	„
Wool Fat Pitch	20	„
Red Oxide of Iron	30	„

For melting up the base materials, a steam-jacketed pot is recommended on safety grounds since 35-45 % of solvent (solvent naphtha or white spirit) must be incorporated by heat. The low melting fat pitches are first melted, the temperature being gradually adding the natural asphalts and continuing to heat until the small percentage of moisture normally present in the latter has been eliminated. The molten mixture of base substances is allowed to cool down to 80°C. before proceeding to incorporate the pigments and, last of all, the solvent. Throughout the entire operation the stirring gear must be kept running.

LAUNDRY STARCH

Rice Starch	99	oz.
Sulphated higher fatty alcohol	1	„

If tablets are required mix with 2 oz. glucose and form.

VINEGAR

Vinegar is produced by the fermentation of sugarcane or other fruit juices. Any substance which is capable of undergoing the alcoholic fermentation is further liable, under the influence of a microscopic plant and exposure to the air at a temperature of 24°C to 35°C to undergo further change with oxidation, which converts the alcohol into acetic acid.

To prepare vinegar, very cheaply, take a mixture of 1 part of acetic acid and 99 parts of sugarcane juice. Gently warm the solution and then allow to percolate through beach wood savings, previously steeped in vinegar, contained in a wooden tub provided with a perforated diaphragm. It is essential to the success of the process that a current of air shall pass through the tub. In order to establish this current pierce near the bottom of the tub equidistant holes forming a horizontal row, and insert vertically four glass tubes in the diaphragm of sufficient length to project above and below it. The air enters by the holes below, and passes out by the tubes. Although the air is necessary for the furnishing of oxygen, acetification consists chiefly in the oxidation of the alcohol. During the process the temperature rises to 104°F. and remains nearly stationary while the process is going on favourably. The liquid is drawn off by a discharge pipe near the bottom, and must pass three or four times through the tub before the acetification is completed, which generally occupies from 24 to 30 hours.

TOMATO SAUCE

Select sound mature red tomatoes. Wash and blanch in hot water for 2 minutes and peel them. Crush and cook and pass through a screen to separate the seeds. Measure out the pulp and for every gallon add :—

Common Salt	2	table spoonfuls.
Sugar	3	" "
Red Peppers	2	" "
Spices (Ground cloves, cinnamon, blackpepper)	2	" "
Onions (finely chopped)	2	" "

Tie the spices and the onion in a muslin piece. Cook the pulp with the above contents and then add one pint of good vinegar. Cook till the pulp acquires creamy consistency. Pour the hot sauce in hot sterilized bottles, cap and sterilise the capped bottles at 212°F for an hour.

TABLE SALT

9 A. D. I. C., Bharatpur—Desires to know the process of manufacturing table salt.

The impurities in common salt which cause deliquescence are magnesium chloride and calcium chloride, and these cannot be eliminated by purification except at great expense. If 3 per cent. of a carefully prepared mixture of potassium sodium and and calcium phosphates is added this will convert the chlorides into phosphates and also, by the dry nature of the calcium phosphate, make the salt naturally somewhat less prone to absorb moisture. Another method of making the salt non-deliquescent is to estimate the amount of magnesium and calcium chloride present in the consignment and then add the chemical equivalent of sodium carbonate and phosphate to convert these into dry carbonates and phosphates. Disodium hydrogen phosphate may be used as the phosphate. The salts are mixed in and the whole dried at 100°C. The amount of phosphate present varies a little. It may be varied from 3 to 4 per cent. and not more than this.

ULTRAMARINE BLUE

31 O. P. G., Delhi—Wants to manufacture ultramarine blue.

China clay	100	parts by weight.
Sulphate of soda	41	" "
Carbonate of soda	41	" "
Carbon	17	" "
Sulphur	13	" "
Sulphite of soda	26	" "

Take the ingredients free from iron and grind fine. Next heat in a muffle furnace in closed pots. This produces white ultramarine and turns green on exposure to air for some time. The latter is mixed with 4 per cent. sulphur and roasted in shallow pans, must be well stirred.

PIN WHEELS

88 S. R. M., Kumbakonam—Desires to know the process of making pin wheels.

First prepare the composition as follows :—

Meal powder	10	parts.
Fine grain gun powder	5	"
Saltpetre	4	"
Steel filings	6	"
Sulphur	1	part.
Charcoal	1	"

Mix.

Now take several pieces of Kraft paper and cut them into strips 4" wide and 12" long. Roll them into short tubes getting the opening at one end somewhat larger than that at the other. This may be done

by rolling a V-shaped strip of paper on one end of rod. When a quantity of these tubes have been rolled close, the smallest end by twisting or folding it over, dry them and fill up each tube with the powder mixture. Jolt the tubes occasionally to be sure none are only partly filled. Then close the top end and wrap them all in a wet towel for several hours. When they are dampened and rolled out punch out a lot of round pieces of straw-board, with a hole through their centre. Then get a piece of brass, the same size as the cardboard centres and fasten it to the work table. Lay one of the centres on this brass plate and taking a filled pin-wheel tube press the smallest flat end against its edge and twisting it around disc with the right hand while left hand feeds the tube as it is being wound on, continue until all the tube is rolled around the centre. The brass plate should be half as thick as the finished pin wheel so the cardboard centre will be held just about in the middle of the pin wheel so the cardboard centre will be held just about in the middle of the pin wheel it is being twisted.

Now have some boards prepared with strips of wood ¼" square, nailed on them, the same distance apart as the width of a pin wheel when it is lying down. When the weight pin wheel is twisted up as above, lift it off the brass plate and set it between two of the strips on the board so as to keep it from untwisting and with a brush put a drop of glue across the pipes and into the centre disc, at four equidistant points. When they have dried they may be removed from the boards and are ready for use.

GILDING GLASS BANGLES

89 N. S. B., Nagpur—Wants to know the process of gilding glass bangles.

Glass bangles are gilded by blending powdered gold with gum water and a little borax, and applying the mixture by means of a camel hair pencil. Gold powder required for the purpose is prepared by rubbing down gold leaf with a little honey or gum water in a porcelain dish until the gold is completely transformed into powder, after which the honey or gum is washed away. The process may be repeated three or four times to obtain the desired effect. The painted bangles are then heated in an oven or furnace, by which means the gum is burnt, and the borax, vitrifying, cements the gold to the surface.

SILVER NITRATE

92 D. R. V., Bombay—Wants to manufacture silver nitrate and mosquito coil.

Silver nitrate is prepared by digesting metallic silver with moderately strong nitric acid; the silver speedily dissolves, especially decomposed yielding oxygen to the silver, and liberating oxides of nitrogen which in contact with air becomes brown. The clear solution is then evaporated, either to the crystallising point or to dryness. If ordinary standard silver be used the solution will contain some nitrate of copper; in this case it must be evaporated to dryness, and gradually heated till all the nitrate of copper is decomposed, which may be known by taking a little of the salt, dissolving in water, and adding excess of ammonia; when, if copper be still present, the solution will have a blue tint. When all the copper is thus rendered insoluble, the fused mass is dissolved in distilled water, evaporated and crystallised.

MOSQUITO COIL

Saw dust	10	parts.
Powdered charcoal	6	„
Nitre	2	„
Gum Benzoin	4	„
Hard tolu balsam	2	„
Insect powder	4	„
Water		q.s.
Green colour	2	parts.

Reduce all the ingredients separately to fine powder and pass through sieve. Next dissolve the nitre in a small amount of water. Make a stiff mass of wheat flour with this nitre solution using more water if required. Incorporate into mass the mixture of saw dust and charcoal powder. Add a little more water, if required. Lastly mix the remaining ingredients. The mass thus produced is put into a plodding machine where by means of a spiral screw, the mass is forced under great pressure through a number of holes of required diameter, so that the mass passes out of the machine in the form of a number of continuous rods or pencils. These rods are collected over a horizontal table and cut off in equal lengths. Then convert into coils by turning them with a wooden rod and expose to dry. Pack.

VINEGAR

Molasses	1	gallon.
Acetic Acid	4	lbs.

Put the ingredients together into a cask of about 40 gallons capacity. Fill it with distill water; shake it up and let it stand from one to three weeks, and the result is good vinegar.

ENAMEL PAINT

170 S. T. R., New Delhi—Wants formula of enamel paint, thinner, rubbing paste.

The enamelled paints can be made by mixing varnish and pigments. The oil varnish is heated and reduced about 25 to 35 per cent. by the evaporation of spirit, and the colours are added while the varnish is hot. For a white paint either white lead, zinc white, or barium sulphate is used with larger quantities of turpentine and some china clay if a matt surface is required. Driers are also added, manganese borate being a favourite substance. The following formula is generally recommended :—

Zinc white	15	lbs.
White lead	8	"
Oil varnish	1¾	gallons.
Oil of turpentine	1¾	"
Rosin	3	lbs.
Blue		a trace.
Manganese borate or calcined zinc sulphate	4 to 10	oz.

THINNER

Ethyl acetate	9	parts.
Butyl acetate	8	"
Butyl alcohol	8	"
Ethyl alcohol	9	"

Mix and use.

RUBBING PASTE

Tallow	10	parts.
Soft Soap	18	"
Soft Paraffin	10	"
Water	9	"
Tripoli Powder	32.7	"
Hard Paraffin	2	"
Japan Wax	2	"
Ammonia Liquor	1/5	part.
Cassia Oil	1/5	"
Resin	1	"
Turpentine Oil	10	parts.
Brick Dust	5	"

Melt the tallow, soft and hard paraffin, resin, and Japan Wax over slow fire. When melted mix the soft soap and turpentine oil with stirring. Remove from the fire and incorporate the tripoli powder and brick dust. Then mix the ammonia and cassia oil. Stir for a few minutes and then put in pots.

LUSTRE POLISH

179 S. B., Moradabad—Wants to manufacture lustre polish.

Tallow	1	lb.
Red oxide	2½	oz.
Rotton stone	2	oz.

Mix the oxide and rotton stone. Then melt the tallow and incorporate the other materials. Remove from heat but continue stirring for a few minutes more. Then pour into moulds.

PURITY TEST FOR GHEE

182 S. C. M. C., Deesa—Desires to know a process of testing purity of ghee.

There are various methods of testing ghee but not a particular one will give a correct result. But following a number of processes one may be able to determine the purity of ghee correctly. Of course the refractometer method, which is followed by the ghee dealers one may be able to know whether the ghee is pure or adulterated. No exact proportion of the adulteration may be obtained by this method. The method is very simple and even a novice can find out the result. The apparatus is known as Butyro-refractometer or butter refractometer. It gives colour-fringe of oils and fats together with their refractimetric value of a definite temperature, say at 40°C. In this method it has been proved that the refractometric range for pure samples of butter-fats is limited between 40.0°—43.5° at a temperature of 40°C. In this method it has been proved that the refractometric range for pure samples of butter-fats is limited between 40.0°—43.5° at a temperature of 40°C and the colour fringe observed, though invariably colourless, is also at times violet tinged. Whereas for other types of fats and oils namely, cocogem, coconut oil, groundnut oil, sesame oil, and vegetable ghee. Other respective colour-fringes are deep orange, bluish-green, yellowish-green and blue.

SOLDERING PASTE

The semi-liquid mass termed soldering paste is provided by mixing zinc chloride solution or that of ammonia-zinc chloride with starch paste. For preparing this composition, ordinary potato is made with water into a milky liquid, the latter is heated to a boil with constant stirring, and enough of this mass, which becomes gelatinous after cooling, is added to the abovementioned solutions as to cause a liquid resembling thin syrup to result. The use of all zinc preparations for soldering presents the drawback that vapours of a strongly acid odour are generated by the heat of the soldering iron, but this evil is offset by the extraordinary convenience afforded when working with these preparations. It is not necessary to subject the places to be soldered to any special cleaning or preparation. All that is required is to coat them with the soldering medium, to apply the solder to the seam, etc., and to wipe the places with a sponge or moistened rag after the solder adheres readily with the use of these substances, a skilful workman can soon reach such perfection that he has no, or very little, subsequent polishing to do on the soldering seams.

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

SALARY VERSUS COMMISSION

4 M. P. K., Darbhanga—Would it increase my nett income, if, instead of paying monthly salaries to my assistants in my general stores shop, as I am now doing, I were to start giving them a certain percentage of the profits ?

Answer :—Many things have to be taken into consideration in answering your question. The first and foremost is, how long have you been running the business ? If it has been in existence for a reasonably long period, and if it is believed by your assistants not to be in any imminent danger of being closed down in the near future through mismanagement or lack of funds or customers, the chances are that your assistants will gladly and eagerly accept your proposal for paying a percentage on the profits (if that is fair and reasonable) as soon as you make it. If, on the other hand, your business be a new one, or if these assistants happen to have, through some reason or other, any doubts about the stability and profit-making capacity of your business, they might very well hesitate before accepting your offer. Shop assistants, especially of a firm like yours, which you have said is a general store are generally recruited from poor and needy classes, who cannot really afford to be told at the end of the month that they are not to get anything as the firm has made no profit that month. Profit or no profit, they must keep the wolf from the door and provide for their expenses. That being so, they are not likely to agree to the commission scale of payment without some satisfaction in their mind that they will receive some thing at the end of their month's work.

The point, however, is this, that if your business be firmly established with a fair and reasonable prospect of earning decent profits month after month, you might not feel inclined to let your assistants earn more than the amount of their fixed salaries, by allowing them a percentage on the profits.

This would be a short-sighted policy on your part. It is true that your assistants would in the latter case, win more than the amount of their salaries. Human nature being what it is, you might rest assured that these assistants of yours would undoubtedly work harder than that they would otherwise have done, and thus secure greater profits to you. Remember that you will pay them a percentage of the profits only, and keep the rest. Why should it therefore matter to you so long your own income is increased, whether they get more than what they had been hitherto receiving?

As a via media, however, we would suggest that the best course for you would be to propose that your assistants would be henceforth paid, partly on a salary and partly on a commission basis. This would make them feel that they need not be afraid of defraying their monthly expenses, and at the same time, they would try their level best to earn greater commission by donig work with renewed vigour and activity, thereby securing greater grist for your mill —in the shape of increased profits.

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of Re. 1 stamps for each question. Subscribers outside India are requested to send eight International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

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186 M. S. A., Lahore—You may consult Manufacture of Ink published from this office, price Rs. 3/- postage extra.

187 P. R. M., Baraut—Following is a list of commercial institutes: Davar's College of Commerce, Law, Economics and Banking, Jahangir Wadia Bldg., 51, Esplanade Road, Fort, Bombay: George Telegraph Training Institute, 139, Bow Bazar Street, Calcutta; Government Commercial Institute, 135, Canning Street, Calcutta and Sydenham College of Commerce & Economic, Bombay.

188 S. S., Kotah Jn.—All kinds of wax is may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta and Banshidhar Dutt, 126, Khengrapatty Street, Calcutta.

189 S. M. C. R., Jullundur City—For flour mill and dal plants enquire of the following firms: Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta; Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta; Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Cacutta and Francis Klein & Co. Ltd., 1, Royal Exchange Place. Calcutta.

193 L. L. D., Allahabad—Cycle and cycle accessories may be had of Crescent Cycle & Motor Co., 158, Dharamtala Street, Calcutta; D. Das Bros., 61, Bentinck Street, Calcutta; Hind Cycle Ltd., Kilachand Devchand Bldgs., 45-47, Apollo Street, Bombay; Hindusthan Cycle Manufacturing & Industrial Corporation Ltd., Phulwari Sharif, Patna; India Cycle Manufacturing Co. Ltd., 9, Tiljala Road, Calcutta and Nandy & Co., P62-A, Bentinck Street, Calcutta.

194 P. K. D., Delhi—We cannot supply you the process adopted by some firms. Glue and other materials are melted on waterbath and cast in mould as usual. Process of rubber stamp making will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/12/- including postage. Practical training will help you much for learning rubber stamp making. For this purpose you may negotiate with Rubber Seeven & Co., 156, Cornwallis Street, Calcutta-6.

195 P. B. C. R., Madras—The liquid compressed used in the hydraulic brakes of modern auto consists of equal parts of denatured alcohol and castor oil. The alcohol thins the oil and acts as an antifreeze. The castor oil lubricates the piston and is the fluid through which the pressure is transmitted.

196 R. R. K. D., Burdwan—Chemicals may be had of Calcutta Chemical Co. Ltd., 35, Panditia Road, Ballygunge, Calcutta; Bengal Chemical & Pharmaceutical Works Ltd., 164, Manicktala Main Road, Calcutta; Butto Kristo Paul & Co. Ltd., 1 & 3, Bonfield Lane, Calcutta.

197 L. B. R., Kanpur—Following is a list of herb and drug dealers: Indian Herbs Stores, 31, Mullick Street, Calcutta; Kamala Bhandar, 168B, Cotton Street, Calcutta; Khaitan Sons & Co., 2, Dalhousie Square East, Calcutta; Banshidhar Dutt, 126, Khengrapatty Street, Calcutta; P. C. Dawn & Co., 1, Mechuabazar Street, Calcutta; and Bengal Herbs Stores, 2, Mullick Street, Calcutta.

198 M. D. H., Mandi—Electric lamps may be had of Asia Electric Lamp Co. Ltd., 45, Durga Charan Mukherjee Street, Calcutta-3; Bengal Electric Lamp Works Ltd., 7, Hasting Street, Calcutta; Calcutta Electric Lamp Works Ltd., 3, Mangoe Lane, Calcutta-1; Mysore Lamp Works Ltd., Malleswaram Post, Bangalore-3 3 and Philips Electrical Co. (India) Ltd., 2, Heysham Road, Calcutta. Canvas shoes may be had of Imperial Rubber Works, 10, Paymental Garden Lane, Calcutta; Kohinoor Rubber Works, 46-6, Canal East Road, Calcutta and Premier Rubber Works, 92, Narkeldanga Main Road, Calcutta.

199 S. I. W., Berhampur—Sheet metal working machine may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta, and Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

200 S. I. W., Berhampur—Tin containers may be had of Bengal Tin Box Mnfg. Co., 1, Jadu Nath Mitter Lane; Metal Box Co. of India Ltd., 41, Chowringhee Road, and Calcutta Tin Factory, 14/2, Nirode Behari Mullick Road; all of Calcutta.

201 P. S. G. M. C., Titilagarh—An article on carbon brush manufacture appeared in April, 1953 issue of Industry.

202 G. C. B., Agra Cantt.—Following is a formula of bottle capping compound :—Gelatin 1 oz.; gum arabic 1 oz.; boric acid 20 gr.; water 16 fl. oz.; starch 2 oz. Mix the gelatin, gum arabic and boric acid in 14 fl. oz. of cold water, stir occasionally until the gum is dissolved, heat the mixture to boiling removing the scum and strain. Also mix the starch intimately with the remainder of the water and stir this mixture into the hot gelatin mixture until a uniform product results. As desired the composition may be tinted with any suitable dye. Before using it must be softened by the application of heat.

203 D. R. S., Lucknow—Following is a formula of eau-de-cologne: Bergamot oil 1 oz.; lemon oil ½ oz.; rosemary oil 2 dr.; neroli oil 30 dr.; lavender oil 4 dr.; orange oil 2 dr.; rectified spirit 2 lbs. Mix the ingredients with brisk shaking one by one. Set the whole aside in a stoppered vessel for 2 weeks and during that period shake the vessel thrice daily at fixed time, finally filter and pack. All the ingredients may be had of Ghose Bros., 50, Ezra Street, Calcutta and Paradise Perfumery House, 7, Colootola Street, Calcutta.

204 K. C. W. R., Delhi—The foam producers are made from saponin. The saponin is obtained by exhausting soap bark, soap root and soap nuts with water. The albuminoids in the solution are then precipitated by means of formaldehyde and the clear solution is evaporated to dryness in a vacuum. The resulting product is a very hygroscopic powder which must be kept in well stoppered bottles as otherwise it conglutinates to form difficulty soluble lumps. The simplest foam extract consists of a solution of 1 part saponin in 9 parts hot water which is filtered if necessary, and rendered soft by addition of 1 per cent sodium benzoate.

205 I. T. M. C., Bombay—Cardboard cutting machines may be had of John Dickinson & Co. Ltd., 6, Clive Row, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

206 I. P., Bhadrak—You may manufacture panmasala, ink powder in your village. This will not require large investment.

207 D. C. L., Mysore—Following is a list of battery manufacturers: Alight Battery Manufacturing Co., 42, Durga Charan Doctor Road, Calcutta; Indian Battery Manufacturing Co., 5, Dum Dum Road, Calcutta; Sakti Storage Battery, 32B, Mahim Halder Street, Calcutta and Amco Ltd., Meher Bldgs., P. O. Box 38, Fort, Bombay.

208 A. R., Dacca—Mantles are knitted from artificial silk fabric cut into suitable lengths and stitched. These are next dipped in the following impregnating solution : Thorium nitrate 100 parts; cerium nitrate 1½ parts; beryllium nitrate 5 parts, distilled water 2000 parts. Mix. The time of immersion of the artificial silk mantles varies from about 2 minutes to about 13 minutes according to the nature of artificial silk. For machine write to W. H. Brady & Co. Ltd., Mercantile Bldgs., Lal Bazar, Calcutta.

209 K. V. R., Madras—Following is the process of colouring electric bulbs. Dissolve 25 parts of bleached shellac, 5 parts of powdered rosin and 1 part of gum benzoin in 100 parts of methylated spirit and add spirit soluble aniline dye (light fast) of the colour desired.

210 S. A. B., Allahabad—Following is a recipe of fruit salt: Tartaric acid 2 oz.; sodium bicarbonate 2 oz.; magnesium sulphate 1 oz.; potassium bitartrate 2 oz.; white sugar 2 oz. Reduce the ingredients to powder separately. Then put them in a hot chamber to remove their water of crystallisation. Lastly mix thoroughly and pack in bottles.

211 M. R. B., Patna—Following is a formula of slate pencil: Ground slate 60 parts; ground limestone 30 parts; silicate of soda 10 parts. Knead the ingredients together into a plastic mass and then force through a perforated steel plate. The pencils are next cut into desired sizes when dry. The shaping is done by laying the pencil in a trough, the bottom end being gripped automatically in a holder which revolves at an angle, and the end is held against a rough stone revolving at high speed in water.

213 S. C. J., New Delhi—For wirenail making machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

214 P. K. R., Chinsurah—Chemicals you require may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane; Butto Kristo Paul & Co. Ltd., 1 & 3, Bonfield Lane, and Allied Agency, 16, Bonfield Lane, all of Calcutta. Dyes may be had of Fuzzle Hussein & Bros., 44. Armenian Street ; and Champalal Agarwala, 43, Armenian Street ; both of Calcutta.

215 I. P. A., Kothagudium—You may negotiate with the following bristle merchants for supplying bristles: India Bristle & Lard Supply Co., 31-1, Tangra Road; Khaitan Sons & Co., 2, Dalhousie Square East; and S. Mazumdar, 67-B, Netaji Subhas Road, all of Calcutta.

216 B. D. C. R., Jharia—Aluminium wares may be had of Aluminium Corporation of India Ltd., 9, Netaji Subhas Road; Aluminium Manufacturing Co. Ltd., 4, Fairlie Place; Indian Aluminium Co. Ltd., 6, Council House Street and Jeewanlal (1929) Ltd., 31, Netaji Subhas Road; all of Calcutta.

218 M. P. U., Agra—Following is a recipe of ink powder: Methylene blue 25 oz.; methyl violet 5 oz.; potassium dichromate 2 oz.; soda ash 3 oz.; sugar 2 oz. Pulverise and mix.

219 D. B. S., Kanpur—Address of Bharat Glass Works Ltd., is Belgharia, West Bengal. Addresses of chemists and druggists, glass factories, etc. will be found in Industry Year Book and Directory published from this office, price Rs. 17/- including postage.

220 B. B. C. D., Lucknow—Although certain plastics can be etched with alcohol, acetone, benzol, caustic alkalies and modern hydrocarbon solvents, the most reliable method of plate making with synthetic resins (plastics) is by direct moulding from relief or intaglio etchings. The wide range of plastics and the different chemical nature of such materials render difficult any specific formulae for the purpose.

221 A. L. B., Bombay—Following is a recipe of ginger beer powder: Bruised ginger 50 parts; cream of tartar 60 parts; powdered sugar 9 parts, oil of lemon 1 part. Mix intimately and put up in 2 oz. packets. Following is a formula of wax pencils: Ceresin 40 parts; carnauba wax 32 parts; Japan wax 24 parts; talc 50 parts; colour q.s. Melt the waxes together, add the talc and colour and heat over water bath for approximately 30 minutes, then pour into suitable moulds. The colours used are: White-zinc oxide 15 parts; Blue—Paris blue 12½ parts; Red—Cinnabar 15 parts; yellow—Chrome yellow 15 parts; Black—Lampblack 8 parts.

223 D. Q. S., Darbhanga—Following is a process of making mango preserves: Prepared mango 2 lbs.; sugar 2 lbs.; water 2 lbs. Peel and cut the fruits in proper sizes. Dissolve the sugar in water and boil. Then add the mango pieces and boil the whole for half an hour or until the fruit is cooked and the syrup is thickened heavily. Then remove from the fire, and allow it to cool, then pour into jars and seal.

225 D. L. B., Patna—Following is a list of beedi manufacturers: Bhailal Bhikhabhai & Co., 99-2, Lower Chitpur Road; Mooljee Sicka & Co., 51, Ezra Street; Shankarlal Dayaram, 152, Harrison Road and Surattee Tobacco Co., 18, Zakariah Street; all of Calcutta.

226 C. V. S., Rajahmundry—For melting aluminium you should use crucible and furnace.

227 E. D. L., Lahore—For cotton waste, you may write to Barat Bros. & Co., Jamnabai Mansion, Sandhurst Road, Bombay-4; Textile Waste Co., 113C, Netaji Subhas Road, Calcutta-7; Cotton Ginning & Pressing Factory, Sirhind, Patiala; Morarji Ranchoddas, 20, Venkatachala Mudaly Street, Madras-3; Overseas Waste Cotton Co., Parekh Mahal, Church Gate Street, Bombay; L. N. Perma Nand, Colonelgunge, Kanpur and East India Trading Co., 2, Church Lane, Calcutta.

228 R. M. P., Madras—Following is a formula of synthetic indigo: To prepare indigo heat aniline with chloracetic acid of equal proportion for 1 to 2 hours whereby phenyl glycine is obtained. This is then fused with sodamide (prepared by heating metallic sodium in a stream of dry ammonia gas) when the phenylglycine is converted into indoxyl with the evolution of ammonia gas, which should be collected and used again. To obtain indigo the indoxyl still in the fused state is dissolved in water and air blown through to oxidise and condense the indoxyl which is then oxidised and condensed to indigo.

230 J. B. A. E. M., Tabara—You better advertise for securing loans. In the meantime you may negotiate with the following firms: Napoo Sensee & Co., 83, Clive Road, Dana Bunder, Bombay; Shree Krishna Trading Co. Ltd., 11, Alli Chambers, Medows Street, Fort, Bombay and P. C. Datta (Bankers) Ltd., 32, Swallow Lane, Calcutta.

235 N. S. K. S., Jullundur City—For sanitary goods enquire of the following firms: Bombay Sanitary Engineering Co., 204, Bazar Gate Street, Bombay; Civil & Sanitary Engineering Co. Ltd., 11, Convent Road, Calcutta; Modern Sanitary Stores, 1-1E, Mission Row, Calcutta; Kumar Mukherjee & Co., 21, College Street, Calcutta and Nritya Lall Dutt, 110, College Street, Calcutta.

236 J. N. B., Bombay—Following is a formula of rubber balloon stamping ink: Only glycerin inks are suitable for stamp-

ing rubber goods. A typical formula is as follows: Methyl violet 2 parts; wood vinegar 10 parts; methyl alcohol 10 parts; glycerin 70 parts; distilled water 10 parts. Dissolve the methyl violet in the methyl alcohol. Then add the distilled water and vinegar. Lastly add the glycerin.

238 K. D., Mhow—Following is a formula of table vinegar: Ginger 1 oz.; pimento 1 oz.; long pepper 3 oz.; black pepper 3 oz. mustard 3 oz.; vinegar 8 parts. Bruise the spices and simmer gently in the vinegar for 10 minutes, cool and strain. The vinegar prepared in this way is used with any vegetable.

240 S. N. B., Calcutta—Following is a list of tape dealers: Adhikary Brothers, 71A, Netaji Subhas Road; Allied Trading Corporation, 11A, Netaji Subhas Road, and Bengal Rubber Works, 79, Sambhunath Pandit Street; all of Calcutta.

241 N. K. M., Jullundur City—You perhaps require transfer label which may be had of Signograph Co., Baranagore, Calcutta.

244 B. D. V., Junagadh—Dissolve any organic colour in spirit and apply the solution to the film.

248 J. P. I., Jalpaiguri—For instructors you should advertise in newspapers. Those instructors will supply you list of tools, plants and appliances required for special kind of industries.

249 P. P. J. K., Jagadhri—We have no book dealing with purification of borax.

250 T. S. A. R. S., Dindigul—Following is a formula of adhesive for leather belts: (1) Carpenters glue 500 grams; water 1000 c.c.; (2) Isinglass 500 grams; water 1000 c.c. (3) Tannic acid 15 grams; alcohol 50 c.c.; water 150 c.c. Soak 1 and 2 separately for 24 hours. Put both together in a pot and heat up to boiling. Add the solution 3 slowly take up to a boil again and cool. The adhesive should be heated for use and should be applied upon a belt which has been well sharpened by a plane. The edge should be long, 1½ to 2 times of the breadth of the belt. Pigment colours may be had of Champalal Agarwala, 44, Armenian Street, Calcutta.

251 M. B., Boradabad—You have to make moulds yourself. Ready made moulds are not available. Plaster of paris may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta. Plastic articles may be had of Popular Plastic Products, 4, Upper Chitpur Road, Calcutta and Hindusthan Plastic Co., 8, Royal Exchange Place, Calcutta.

253 P. T. K., Kotah—You may use spray drying machine for manufacturing milk powder. For machine enquire of Volkart Bros., 8, Netaji Subhas Road, and Edward Keventers Ltd., 11/3, Lindsay Street; both of Calcutta.

254 P. R. G., Howrah—Industry Year Book and Directory is already out, price of which is Rs. 17/- including postage.

255 A. V. B. W., Ahmedabad—Your enquiry appears in Trade Enquiry columns.

257 A. A. J., Khulna—Formulas of liquid gas, copper sulphate, etc. will appear in due course.

258 A. B. G., Nowgong—Slate stones are not available in Assam. Process of manufacturing artificial slate will appear in due course.

259 G. S., Agra—Following is a list of hosiery dealers: A. Ebrahim Bros., 15, Zakaria Street; A. K. Sinha, 29-30, Chandney Chowk; B. V. Reddy & Sons, 171A, Harrison Road; Bengal Hosiery, 31-32-33, Chandney Chowk; Burdhan & Co., 36, Chandney Chowk and Jewan Bukhsh Mohd. Jan, 78, Colootola Street; all of Calcutta.

260 R. R. T., Bankura—We have no other book on mirror making except Independent Careers for the Young which you have already got.

261 P. A. M., Somarpet—You have to register the name of your firm with The Registrar, Joint Stock Companies, Madras.

264 S. S. A. W., Bangalore—Badminton ball manufacture involves mechanical processes such as cutting the cork, binding tape, setting the feathers, etc. You have to try the process yourself when you will be successful.

265 M. V. I., Kunnamkulam—Process of cotton dyeing and printing will be found in Cotton Dyeing and Printing which is out of print.

266 S. M. Y. S., Trivandrum—Soap machine may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta. Raw materials may be had of Calcutta Mineral Supply Co. Ltd., 13, Jackson Lane, Calcutta.

271 M. B., Moradabad—You have to analyse gypsum and plaster of paris for ascertaining the water content of them. You better consult a Chemical Engineer who will supply you a sketch of muffle furnace.

276 J. C. B. C., Jugsalai—Aleppo galls may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta.

277 M. C. S., Madurai—Addresses of photo goods dealers will be found in Industry Year Book & Directory published from this office.

278 G. K. S., Manbhum—Recipes of resin plaster and emplustrum belladona will appear in due course.

279 B. R. D., Chinsurah—Leather goods may be had of Bangaluxmi Leather Works, 10-B, St. James Square; Basu Factory, 75/1, Harrison Road; Bengal Leather Industries, 10/C, St. James Square; Chinese Leather Syndicate Ltd., 2/1, Russell Street; Indian Leather House, 78/1, Harrison Road and New India Leather Works, 94, Harrison Road; all of Calcutta. Following is a process of manufacturing magic serpent: Fuse in a crucible equal parts by weight of yellow prussiate of potash and flowers of sulphur; it is advisable when the heat cannot be well regulated to include a little carbonate of potash. Lixiviate the mass with water and filter; the filtrate will be sulphocyanide of potassium, which upon being added to a solution of mercury dissolved in nitric acid gives a copious precipitate of sulphocyanide of mercury. Collect this wash well with water, and dry roll it out and cut into pieces of desired sizes and dry.

280 P. S. P., Coimbatore—Following is a process of preparing rubber solution. In order to prepare rubber solution fresh raw rubber cut in small pieces is placed in a bottle of naphtha or benzine in the proportion of 1 part of the former to 5 of the latter. The rubber gradually swells absorbing the solvent and eventually loses its tenacity. Now the mass on vigorously stirring or the bottle on shaking at a certain stage and the treatment repeated from time to time an apparently homogeneous solution is finally obtained. This rubber solution is very sticky and tenacious. But if the raw rubber is not fresh, it is better to masticate in a kneading machine whereby it is reduced to impalpable paste. Now take one part of this paste and put it into 5 parts of naphtha or benzene contained to a suitable bottle. Shake for a while. The rubber readily goes into solution into a less viscous mass than untreated rubber.

281 M. L., Porbandar—Indian herbs may bo had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta; Banga Lakshmi Bhandar, 13, Cotton Street, Calcutta; Bengal Herbs Stores, 2, Mullick Street, Calcutta and Indian Herbs Stores, 31, Mullick Street, Calcutta.

282 M. A. W., Trivandrum—Aerated water making machines may be had of Essence & Bottle Supply Agency, 14, Radha Bazar Street, Calcutta; Andrew Yule & Co. Ltd., 8, Clive Row, Calcutta and Sirajul Arifeen & Co., 1, Ezra Street, Calcutta.

283 K. P. E. C., Jamnagar—Following is a process of curing animal skins with hair on: Stratch the skin and tack it tightly on a board; scrape off all the fat with a blunt knife and also remove as much of the congealed blood as possible. Now soak a rag with strong acetic (33 p.c. but no stronger) acid and rub it well into the skin, going into every nook and corner, set aside to dry for one or two days, then repeat the acid dressing. When this second dressing is thoroughly dry apply a 10 p.c. solution of ammonium sulphate with a good size paint brush and apply similarly a 10 p.c. solution of washing soda. The ammonia then liberated slowly neutralises the acetic acid in the skin. This process is repeated the next day and then after two days, the skin is rinsed under the tap, while tacked the board, using the hand to cause the water to penetrate. Set aside to drain and then dry slowly, in a warm room, but not against the fire. Finally when dry, rub well with either benzoated lard of linseed oil.

284 R. L. D., Allahabad—Following is a list of bristle merchants: Indian Bristles and Lard Supply Co., 31-1, Tangra Road, Calcutta; S. Mazumdar, 67-B, Netaji Subhas Road, Calcutta; Ghurey Lal & Sons, Khaikana, Latouche Road, Kanpur and Harbilas Rai & Co., La Touche Road, Kanpur.

285 I. N. D., Karnal—Soap flake making machine may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. For printing and stamping machine for the pencils enquire of Alfred Herbt (India) Ltd., 13/3, Strand Road, Calcutta.

Trade Enquiries

(To communicate with any party write to him direct with name and address given below mentioning Industry.)

255 The Ambika Vijay Brush Works, Revdi Bazar, Cross Lane, Railwaypura Post, Ahmedabad—Wants to be put in touch with the dealers in raw materials for brush such as palmyra fibre and Mexican Bristol fibres.

352 Khoja Nurdin Ismail A. K., 110, East Mada Chuch Street, Royapuram, Madras-3—Can supply peacock feather in large quantity.

IMPORT OF WHEAT FOR FLOUR MILLS

The following Public Notice (No. 122-I.T.C. (PN)/53, dated the 5th September 1953) has been issued by the Government of India in the Ministry of Commerce and Industry:—

In order to enable flour mills to establish their pre-war export markets, Government have decided to permit exports of wheat flour by flour mills. For this purpose, wheat will be released by the Ministry of Food and Agriculture on applications made by flour mills on the condition that equivalent quantity of wheat will be imported by them to replace the stocks released to them earlier, within a period not exceeding six months from the date of export.

Applications for import licences for import of wheat should be made by the flour mills to the Chief Controller of Imports, New Delhi, along with documentary evidence, such as, bills of lading, and bankers certificates, etc., showing the extent and value of the actual exports made by them and a certificates, etc., showing the extent and value of the actual exports made by them and a certificate from the Ministry of Food and Agriculture, showing the quantity of wheat released by them earlier.

CONCESSION FOR CLAIMING LICENCES OF SOFT CURRENCY QUOTA ON THE BASIS OF IMPORTS FROM DOLLAR AREA

The following Public Notice (No. 127-ITC (PN)/53, dated the 12th September 1953) has been issued by the Government of India in the Ministry of Commerce and Industry :—

In the licensing period, January-June 1953, according to paragraph 15 of Section 1 to the Policy Book for that period, in the case of items for which the soft currency quota was higher, the importers could, in lieu of the general licence, take a Soft Currency licence calculated on the higher rate provided the importers wishing to take advantage of this concession chose the sa basic year for Dollar and Soft Curre imports. This concession was thought be unnecessary for the current licensi period, largely because it was hoped th most of the cases of importers wishing obtain Soft Currency licences at the cas of importers wishing to obtain Soft Curre cy licences at the higher rate will be covere by virtue of the procedure of multipl licensing. It has been represented that i some cases, this hope has not been fulfilled and some of the importers are experiencin considerable difficulty because of the non availability of this concession.

The representations have been considered and it has been decided to give consideration on merits to the applications of importers for the grant of a Soft Currency licence calculated at the higher rate in lieu of the general licences, a Soft Currency licence, based on imports from Hard Currency Area but calculated on the Soft Currency quota percentage, are advised to submit their applications to the licensing authorities at the ports along with the following documents :—

- (*i*) treasury receipt ;
- (*ii*) the quota certificates issued to the firm for both Soft and Dollar Areas ;
- (*iii*) the licences obtained by them in the current period for Soft Currency Area and Dollar Area, respectively.

This will be necessary in the case of importers who have already obtained the licence for Dollar Area, but who desire to surrender that licence in lieu of obtaining a Soft Currency licence on the Dollar imports.

- (*iv*) Statement furnishing reasons for for claiming this concession in the current period.

Applications, submitted in accordance with the procedure outlined in the preceding paragraph, will be considered by the licensing authorities on merits.

SUPPLY OF MOTOR LORRY COMBINED FOR CARRYING REFUSE AND NIGHT-SOIL

Office of Issue.—The Directorate General of Supplies and Disposals, Shahjahan Road, New Delhi.
Tender No. SVI/17796-D/Iv.
Due by 11-30 a.m. on the 9th October 1953.
Sealed tenders are invited for—

Description of Stores.	*Quantity.*
Motor Lorry consisting of a 158" W. B. chassis 3 ton capacity, complete with cab and body, suitable for removing either loose refuse or night-soil in standard cylindrical drums, complete with spare stepney wheel with tyre and tube and standard tools as per D. G. S. & D. Drawings No. 3673, 8071 and 8072 -- --	1 No.
Price per tender set --	Rs. 10-8-0
kegs -- -- --	90 cwts.

(inclusive of cost of 3 drawings).

SUPPLY OF METAL PRIMER, ETC.

Office of Issue.—The Directorate General of Supplies and Disposals (Miscellaneous Stores Directorate), New Delhi.
Tender No. SG-I/22420-D/D.
Due by 10 a.m. on the 13th October 1953.
Sealed tenders are invited for—

Description of Stores.	*Quantity.*
1. Metal Primer, Synthetic, "D.Q.D." or equal best trade quantity, packed in 5 gallon new and sound drums --	600 galls.
2. Wood Primer, Synthetic "D.Q.D." or equal to best trade quality, packed in 5 gall. new and sound drums --	180 "
3. Paint Remover, Synthetic, "D.Q.D." or equa best trade quality, packed in 5 gallon new and Sound drums --	250 "
4. Filler Grey, Synthetic, to Specn. G/P/307/263 packed in 56 lb. new and sound kegs -- -- --	90 cwts.
Price per tender set --	Rs. 5-0-0

SUPPLY OF RESERVOIR

Office of Issue.—The Directorate General of Supplies and Disposals, Shahjahanpur Road, New Delhi.
Tender No. SRIA/17046-D/II.
Due by 10 a.m. on the 13th October 1953.
Sealed tenders are invited for—

Description of Stores.	*Quantity.*
Reservoir (B.G.) 54" × 22" × ⅜" to I. R. S. Drg. No. VB-306 Alt. I and to I.R.S.S. R-3/53. (Steel Class II) -- --	78 Nos.
Price per tender set --	Rs. 2-0-0

SUPPLY OF HYDRAULIC DROP PIT JACK

Office of Issue.—The Directorate General of Supplies and Disposals, (Railway Stores Directorate), Shahjahan Road, New Delhi.
Tender No. P/SW-3/18308-C/II.
Due by 10 a.m. on the 21st October 1953.
Sealed tenders are invited for—

Item No.	*Deecription of Stores.*	*Quantity.*
1.	15 tons capacity Hydraulic Drop Pit Jack, for M. G. Locos	3 Nos.
	Price per tender set --	Rs. 6-0-0

SUPPLY OF SYNTHETIC AND NATURAL RESIN, ETC.

Office of Issue.—The Directorate General of Supplies and Disposals (Miscellaneous and Chemicals Directorate), New Delhi.
Tender No. SGI/22411-D/D.
Due by 10 a.m. on the 13th October 1953.
Sealed tenders are invited for—

Description of Stores.	*Quantity.* Imp. galls.
1. Synthetic Resin, Enamel White Under-coating to Specn. G/P-307/252 --	1,250
2. Synthetic Resin, Enamel White finishing to Specn. G/P-307/255 -- --	254
3. Natural Resin, Enamel White finishing for interior use to Specn. G/P-307/250 --	1,226
4. Natural Resin, Enamel Traffic Yellow I.S.C. 368 --	128
5. Exterior Oil Varnish, finishing to Specn. G/P-307/242 --	600
Price per tender set --	Rs. 6-0-0

INDUSTRIAL PRODUCTION

Industries		1951	1952	Jan., to April, 1953*	March, 1953*	April, 1953*	April 1952
Major Industries.							
Coal	lakh tons	343.08	362.22	125.91	30.76	32.44	31.85
Steel	lakh tons	14.99	15.78	5.32	1.36	1.23	1.35
Yarn	million lbs.	1,304.10	1,448.30	485.3	116.0	122.0	115.6
Cloth	million yds.	4,076.40	4,603.20	1,614.0	399.0	419.0	365.0
Cement	lakh tons	31.96	35.37	11.42	2.95	2.85	2.98
Paper	tons	1,31,916	1,37,504	45,501	11,390	11,391	11,623
Matches	cases	5,77,200	6,08,200	2,09,500	53,600	51,500	52,400
Sugar	lakh tons	11.15	14.19	10.22	2.66	1.53	1.63
Engineering and Electric Industries.							
Machine tools	value in lakhs of Rs.	47.30	44.37	13.10	4.62	3.30	4.12
Electric lamps	lakhs	155.16	208.81	67.23	16.19	16.07	16.44
Dry cells	crore Nos.	14.34	13.02	4.29	0.98	1.17	1.07
Transformers	k.v.a.	1,94,400	2,14,800	93,300	18,600	25,100	13,400
Motors	h.p.	1,42,000	1,57,600	59,000	15,400	15,400	13,800
Electric fans	Nos.	2,12,400	1,95,500	58,200	13,900	16,700	19,500
Radio receivers	Nos.	68,100	71,495	18,899	4,502	4,426	7,054
Storage battery	Nos.	2,10,000	1,58,400	45,300	13,200	13,600	14,700
Cables and wires—							
Copper conductors	tons	3,000	5,928	2,958	948	805	367
Winding wires	tons	300	298	134	26	31	42
Rubber insulated cables and flexibles	lakh yds.	411.60	328.6	139.6	36.5	36.4	27.4
Insulators—							
H. T.	Nos.	2,44,800	3,25,000	1,38,800	61,900	42,100	18,800
L. T.	lakh Nos.	14.32	30.50	6.18	2.20	2.20	3.07
Chemical Industries.							
Salt	lakh mds.	743.75	768.64	336.35	85.43	180.16	141.87
Caustic soda	tons	14,724	17,058	5,954	1,596	1,490	1,368
Soda ash	tons	47,532	44,322	18,353	5,077	4,643	2,004
Chlorine liquid	tons	5,268	6,240	2,259	564	525	498
Bleaching powder	tons	3,588	792	346	87	102	29
Bichromates	tons	3,276	1,463	758	215	210	70
Sulphuric acid	tons	1,06,932	96,081	31,319	6,113	8,260	6,010
Superphosphates	tons	61,020	46,650	8,317	2,170	2,100	2,403
Miscellaneous (Minor) Industries.							
Sewing machines	Nos.	44,460	50,045	19,885	5,255	4,943	4,551
Hurricane lanterns	lakh Nos.	39.76	35.23	12.59	3.33	3.22	2.44
Bicycles	Nos.	1,14,276	1,96,956	59,864	17,699	16,734	14,214
ycle tyres and tubes	lakh Nos.	88.38	83.55	27.10	4.82	6.28	4.97
otor tyres and tubes	lakh Nos.	16.91	13.83	4.12	0.95	1.17	1.13
igarettes	crore Nos.	2,194.68	2,058.85	639.04	148.09	148.09	172.52
lywood—							
Tea chests	lakh sq. ft.	606.48	782.27	194.03	48.65	50.00	68.84
Commercial	lakh sq. ft.	112.00	122.58	47.44	9.34	10.00	8.28
fractories	lakh tons	2.37	2.43	0.76	0.19	0.19	0.21
rasives	reams	37,200	55,000	21,400	5,300	6,500	3,800
et glass	lakh sq. ft.	110.89	90.42	101.21	28.18	28.18	7.56
ollen manufactures	lakh lbs.	177.00	166.68	50.93	12.52	13.47	10.15
twear—							
estern type	lakh pairs	36.40	33.67	11.34	3.01	3.13	2.84
ndigenous type	lakh pairs	20.73	18.06	6.82	1.66	1.64	1.72
hol—							
dustrial	lakh galls.	68.46	68.45	16.98	4.55	4.10	6.47
wer	lakh galls.	58.09	77.42	27.75	8.07	6.99	6.95

Figures are subject to revision month to month. * Provisional.

Exchange Place, Calcutta.

INDUSTRY PUBLICATIONS

Edited, Printed & Published by K. N. Banerjee for Industry Publishers Ltd.

Industry

MONTHLY MAGAZINE

In praise of

WEST BENGAL SECRETARIAT
HOME DEPARTMENT

CALCUTTA, THE 30th Jany. 1953.

O. C. No. ....

This is to certify that I had known the work of Signograph Co. in connection with manufacture of transfers from the time that I had been on the East Indian Railway as General Manager. They are a pioneer company in this line and have uniformly done good work and when I took over charge as Director General, Transportation, Government of West Bengal, I found lot of money was being wasted over painting of special signs for the Transport Buses. I requisitioned the services of this company for manufacture of transfers for the State Transport Organisation, Govt. of West Bengal, and they have kept up their reputation and done very satisfactory work in the manufacture of the signs for the State Transport. I wish the company every success.

Secretary & Director General,
Transportation, Govt. of West Bengal,

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Only a few molecules of oil
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CONTENTS FOR JULY-AUGUST 1953.

NOTICE

Owing to various unavoidable reasons we could not make ndustry up-to-date in spite of our best effort. In order to nake the Magazine up-to-date now we propose to publish three combined issues containing July - August, September - October and November - December. To compensate and satisfy the subscribers we shall extend the period of subscription by three months after expiry of the same and send additional three copies of Industry.

Manager,

INDUSTRY PUBLISHERS LTD.

... ISSUE.

September-October issue of Industry will contain useful articles on industrial and technical subjects such as Technique of Wet Shampoos; Imitation Pearls and Tests for Detecting Them; Decoration of Tin Plates and Process of Protective Painting in addition to the regular features such as Agricultural Tips; Scientific Researches and Inventions; Engineering Notes; The Business World; Official India; Pharmaceutical Recipes; Formulas, Processes and Answers; Readers Business Problems; and Queries and Replies.

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All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

All enquiries regarding the Subscription or Advertisement Departments should be addressed to the General Manager.

OFFICE HOURS.

Editorial Department	11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays
Subscription and Advertisement Department	10 A.M. to 5 P.M. on weekdays and 10 A.M. to 2 P.M. on Saturdays.

THE HANDLOOM INDUSTRY

India is a land of villages and for all that one may say to the contrary, the rural character of her economy is writ large in the importance which is assigned to her numerous small industries which, along with agriculture provide employment to her millions. But that is no reason why we should be willing to put the hands of the clock back by resorting to what is popularly, though a little ironically, described as villagism. The main task facing us to-day is how to liquidate the hiatus that exists between our rural and urban economies and those who have set themselves the task will be doing a wrong thing if they delude themselves into thinking that our salvation lies in further strengthening the rural character of our economy. As we have suggested in these columns from time to time, we have to urbanise our villages, by which we mean we should carry to all the four corners of our vast country the amenities of urban life and to achieve that aim, we must make it a point to modernise our village industries and agriculture by the employment of improved techniques of production and organisation and also by mechanisation and large-scale use of electrical energy. What is wrong with our champions of villagism is that they are not yet prepared to go forward and modernise our numerous village industries including the handloom industry. On the other hand, the advocates of the mill industry react unfavourably to any move to revitalize our village industries. We have to strike a balance, that is to say, while striving to develop our urban industries we have to pay sufficient attention to the more urgent task of placing the small industries on an even keel and unless we care to erase the aloof wall of artificiality between our two economies, we shall succeed neither in creating opportunities for employment for our people nor in improving their standards of living.

The handloom is undoubtedly the most important village industry in this country and it will be wrong to think that it can be placed on a firm footing only by crippling the competitive capacity of the mill industry just by the employment of a number of artificial and arbitrary restrictions. One may afford to keep floating by holding fast to a life-buoy, but is it not better that one should pick up the art of swimming to do the job more successfully ? It is just this that our supporters of the handloom industry ought to bear in mind while trying to mete out a fair deal to it. Give the industry a chance, a real chance to survive and develop itself not by muzzling its urban and much bigger counterpart but by taking steps to better the quality of its products and by bringing their prices down to the competitive level.

Nearly seven months ago, certain major fields of cloth production, such as dhotis and saries, were reserved for the handloom industry. Judged by its results, however, the move seems to have fizzled out. Large stocks of cloth produced by the handloom are lying unsold. Consumers do not like these products, may be because their prices are high and quality poor. The Handloom Board, however, still persists in holding that the handloom weavers would be benefited if further fields of cloth production are reserved for them. A contention like this seems hollow in view of the fact that we cannot force our consumers to buy handloom cloth unless we take steps to bring down the prices of the products of the handloom industry. We must also remember that our consumers are quality-conscious. A millmade dhoti, for example, worth Rs. 10/- is more than a match for its handloom counterpart of the same value. To expect our consumers to prefer the latter to the former would, therefore, be foolish. And then if we rob them of their right to select the goods of their choice, shall we not be foisting something undesirable on them ? This is not to suggest that we ought to do nothing to keep alive and develop the handloom industry. What we are driving at is that steps should be taken to reduce prices and improve the quality of its products to make them acceptable to our buyers to an appreciable extent.

It is a pity that officialdom in its bid to save the handloom industry thought it fit to cripple the mill industry by imposing a 40 per cent restriction on production of dhotis which became effective in January this year. The measure has given rise to shortage leading to higher prices for millmade dhotis. At the same time the hand-

loom industry has failed to take advantage of it. Consumers remain as averse as ever to its products. Obviously, the proper remedy lies elsewhere and not in the imposition of production restrictions on the mills. By doing as we have done, we have benefited none,—neither the handloom weavers nor the mills nor the consumers. What is worse still, some of the advocates of villagism have gone to the length of describing the mill industry as the villain of the piece. They contend that the handloom industry ought to have come into its own but for the competition from the mills. We wonder what exactly they are driving at. Do they want all the mills to be closed down so that the handloom industry might survive? But have they ever cared to ponder if the handloom industry has the capacity to meet the requirements of our consumers? Mills have been built with painstaking efforts spread over a number of years. Can we not engage in constructive efforts to rebuild the handloom industry without disturbing the even tenor of progress maintained by the mill industry despite all sorts of deterrents?

It will be a sheer logic of reaction to think that we could set things right by restricting the activities of mills or the markets for their products. We should not try to intensify the existing unseemly antagonism and rivalry between the two sectors of cloth production. If we really desire to ameliorate the hardships of our handloom weavers, we must try to analyse their existing backwardness in the correct perspective or, in other words, we must trace it back to its causes and apply the proper remedy to remove them. Referring to the report of the Fact Finding Committee a Bombay Weekly recently pointed out that in 1940 there were 2,193,262 handlooms in undivided India of which 1,755,070 were active. By 1951 the number of handlooms in the Indian Union alone has risen to 2,860,904. The expansion is still going on and creating the crisis of overproduction. Secondly, the mills are in a better position to produce the type of cloth the average consumer needs for his daily use, the type which is strong and durable and cheap. On the handloom, on the other hand, it is not possible yet to produce this type of utility cloth. The handloom is meant for the production of the finer varieties of cloth and there can be no denying the fact that *the handloom weaver is more or less skilled worker, a sort of an artist.* H[illegible] *main job is to put out high quality clot*[illegible] *It is for the mill industry to produce th*[illegible] coarser varieties of cloth and its productio[illegible] being on a mass scale, its products ar[illegible] bound to be cheaper than their handloon[illegible] counterparts. What is wrong to-day i[illegible] that the handloom is trying to mak[illegible] inroads upon the field which ought to b[illegible] reserved exclusively for the mill. As a result, the latter is being crippled but that has not benefited the handloom weaver to any satisfactory extent.

The average purchasing power of the Indian consumer being very low, it will be silly to expect him to buy the superior grade of cloth woven on the handloom. The purchasing power of the common people must, therefore, be improved by taking suitable steps to raise their standard of living. But since this cannot be done overnight, we shall have to take measures to export superior quality handloom products to foreign countries where the people command a better purchasing power and so are in a position to buy fancy goods. In order to stimulate the sale of handloom cloth in foreign countries, we have to improve its quality and undertake publicity campaigns there. The Handloom Board will do a yeomen's service to our impoverished weavers if it devotes its attention to the problems connected with the production and marketing of the handloom cloth. The government must also step in as without its help and co-operation such problems will be difficult to solve.

The handloom weaver must be supplied with better quality yarn and stores and wherever possible, co-operatives must be set up to reduce production costs and to make production remunerative. Better organisation and better methods of supervision will also be called for. Diligent market research will also be necessary. Yet another existing defect is that a too many people are now engaged in handloom production. Their number has got to be reduced and suitable and fresh avenues of employment must be opened out for those who will be thrown out of employ. In order to help the handloom industry on to its feet and strengthen it sufficiently in the interest of its survival, we shall have to curtail production and enable it to turn out quality products.

NEW FOOD POLICY

The new food policy recently announced by the West Bengal Government has sprung no surprise on anybody. For, after all, none of the procurement systems followed since 1943, could yield any satisfactory result. Most cultivators failed to take kindly to the procurement system and the low prices at which they had to sell their produce to the Government only helped to denude food production of the incentives so very necessary to keep it going the way it should. The revised system of procurement, viz. the levy system, would affect only the well-to-do among the cultivators and even the Government had to admit that it was a failure. The procurement drive both under the previous and the new levy systems having fizzled out, the Government has now decided to abandon it altogether. But this does not mean that no purchases of rice will be made by the Government. As a measure of price support, the Government will purchase paddy or rice in areas where the market price goes below a certain level and becomes uneconomic to the growers. Rationing will continue in Calcutta and the surrounding industrial area and at certain other places. Modified rationing will not be abandoned, and it will hearten many that Government has given the word that, if and where necessary, it will send rice to bring down the market price. Yet another important point is that the Centre has decided to honour its commitment to feed Calcutta and other rationed areas. The cordons too will return.

This year the Government is expecting a bumper harvest and if the antisocial elements are dealt with effectively, there should be no reason why West Bengal will not find the price level of rice registering a perceptible fall. It is good, therefore, that procurement will be completely abandoned, for more often than not it tends to inflate prices. In order to feed Calcutta and other rationed areas the Centre may have to draw on its reserves. But it can hardly afford not to take into account the requirements of other State and so, as some think, most of the rice to be supplied to the rationed areas will come from abroad.

There is a good lot of discontent now evident among the people of West Bengal. Whatever the merit of the official claim that there is no real scarcity of rice, its prices are high and quality too is mostly very poor. The main task with which the Government should get to grips is that it must improve quality and ensure the supply of rice at reduced prices. There si also the allied problem of unemployment to be liquidated and it will be foolish to expect an easy solution to it. West Bengal's leftist politicians have welcomed the new food policy generally. But their reaction seems a balanced one. For example, they point out that the Government's expectation of a bumper crop this year may founder. Claims of a like nature had been made previously only to be dashed to the ground just after a lapse of a few months. On the other hand, they are taking a favourable view of the Centre's assumption of responsibility to feed certain areas; they seem happy over the arrangement that the State's entire produce of rice will meet the needs of her districts.

COTTAGE INDUSTRY

It is welcome news that a Cottage Industry Board has been recently set up at Bhubaneswar. Inaugurating the Board, Orissa's Governor, Mr. Fazl Ali exhorted

that greater attention should be paid to utility and standardisation or it would be difficult to expand cottage industries on any appreciable scale. Better marketing facilities are also necessary to make their products popular with the consumers. Mr. Fazl Ali went on to say that cottage industries that could be developed in Orissa were many in number. The products of these industries are rather costly at the present moment and their prices should be reduced as well as quality improved to make them popular among the poorer sections of our population.

Mr. Fazl Ali then detailed the conditions in Japan and said that many of their methods could profitably be copied. It seemed to him that the Board should seriously consider whether it would not be desirable to secure the services of a few technicians and craftsmen from Japan for this State. He deprecated the tendency on the part of the common man in India to look up to the Government even in matters which affected their material advancement. In view of this tendency it would be necessary to set up Goverment institutions to convince village artisans by actual demonstrations that improved tools and modern methods were more paying than tools and processes upon which they had been relying.

OFFICIAL OPINION

Addressing the Mysore Chamber of Commerce on October 3, Mr. H. V. R. Iyengar, Secretary, Commerce and Industries Ministry, said that any measure of readjustment at this stage in regard to the issue of import trade licences might not be easy. The Chamber had urged relaxation of restrictions in issuing import trade licences for smaller units, particularly in the import trade.

The Commerce Secretary said that putting import trade in the hands of the people in the interior after taking it away from major ports, had to some exter been a failure. Giving licences to peopl away from major ports with a vie to benefiting them and seeing that good were made available at reasonable price also had not yielded the desired result. While he sympathized with the Chamber's request, he said, he could not see an easy way for changing the technique of import control.

Referring to the goodwill towards India in the Middle East the Commerce Secretary said, "If we capitalize on this goodwill in the industrial and commercial fields, so much the better for all of us, but it requires sound commercial practices." The Egyptians, for example, have felt glad to learn that India has made some progress in the industrial field and is now able to produce such articles as electric motors, pumps, diesel engines and even locomotives. Let us hope Egypt will be prepared to buy some of her requirements of such articles from us, provided, of course, we are in a position to sell cheaper than her other sources of supply and at the same time improve the quality of our goods. Mr. Iyengar complained that most Middle Eastern countries did not yet know what progress India had made in recent years. Obviously, therefore, we have to put forth increased efforts to publicise our goods abroad.

In the course of his address Mr Iyengar made detailed references to the subject of coffee cultivation in the South He said some policy was necessary which would encourage further cultivation. This policy should take into account the interests of both cultivators and consumers. It is for the Government to examine what is the fair level of prices which will encourage stability of the industry on the one hand and to see that the consumers are no mulcted, on the other. Mr. Iyengar spoke as above in reply to the Mysore Chamber's representation that the interests of larger

traders of coffee should be safeguarded by fixation of prices six months before the commencement of the new season. The Chamber holds that there should be no sudden alteration of prices.

Mr. Iyengar pleaded that there was great scope both for Coorg and Mysore and parts of Madras for the extension of coffee plantation. He added, "If this extension takes places, we shall have an additional source of earning foreign exchange and this would also provide employment to a large number of people." The Coorg Chief Minister has formulated a scheme to extend the coffee growing area to at least 100,000 acres in the immediate future. Mr. Iyengar said that at the rate of one man per acre, this meant employment for 100,000 workers. The Coorg Chief Minister has a scheme under which educated youngmen, after suitable training, could be given grants and made to work on coffee plantations.

PRIVATE SECTOR

In recent years private enterprise seems to have suffered an appreciable decline and some think that the existing tax burden is responsible for this disappointing phenomenon. The main trouble is the non-availability of finance to an adequate extent. The Reserve Bank of India, therefore, has done well in deciding to appoint a Committee to examine how increased finance may be made available to the private sector of our national industries. The Reserve Bank communique announcing the above decision refers to the important role assigned to private enterprise by the Planning Commission in the implementation of the National Plan. Investment in this sector, however, has not reached the level envisaged in the Commission's report.

The Communique adds as follows :—

"The Taxation Inquiry Commission is investigating the effects of the structure and level of taxation of income on capital formation and on the maintenance and development of productive enterprise. There are, however, other factors which influence investment in the private sector. With the approval of the Government, the Reserve Bank has decided to appoint a committee to examine how increased finance could be made available to this sector through sources other than those which are under the consideration of the Taxation Inquiry Commission. In particular, the committee will examine the possibility of providing on a larger scale bank finance for development in the private sector.'

WEST BENGAL UNEMPLOYMENT

The ghost of unemployment is now stalking the entire Indian scene and West Bengal is undoubtedly one of the worst, if not the worst, affected states. The symptoms of this serious malaise which has gripped the entire lower middle class comprising youngmen and women some of whom may be quite as educated and competent as, and even more so than, those who rule us to-day, made their appearance quite a long while ago. But officialdom did not care to do anything to arrest the tide of unemployment which had been engulfing the country gradually but surely. Now that discontent is widespread and agitation for food and employment usual, the State Government have realized at long last that they must do something to end the menace. They have formulated a scheme consisting of the following nine tiers and hope that its implementation will improve matters:—

(1) 30,000 teachers will be appointed during the next three years for carrying on educational and social work in rural areas;

(2) Housing scheme at a cost of Rs. 1.5 crores, giving employment to about 3,500 people;

(3) Development of small-scale industries at a cost of Rs. 75 lakhs;

(4) Establishment of a coke-oven gas plant costing Rs. 9 crores:

(5) Calcutta sewage disposal scheme costing Rs. 3.2 crores at the beginning;

(6) Land reclamation scheme in the Salt lake area, east of Calcutta, at an expenditure of 7.5 crores;

(7) Transmission and supply of surplus electric energy from the D.V.C. to rural areas at an expenditure of 3.75 crores;

(8) Increase in the number of Calcutta's transport vehicles by issuing 700 more licences. This will employ about 1,200 more people;

(9) Implementation of the Ganga Barrage Scheme which will reclaim large tracts of land in Murshidabad, Malda, and Nadia, connecting at the same time the middle and southern portions of the State.

It is said that the above scheme has been submitted to Delhi for approval and grants. In the meanwhile, discontent is growing and unemployment mounting higher and yet higher. Maintenance of tranquillity has become a tough job and many things are taking place which reflect credit on neither the Government nor the people. Calcutta and the surrounding industrial area have become a trouble spot. Hunger marches, strikes, lock-outs, etc., seem to have become the order of the day. Unemployment must be liquidated or there can be no peace nor progress. Not that the Government is taking a complacent view of things any more and so the people have to rid themselves of their apathetic attitude towards their rulers. Not that we want them to sing hallelujah to Officialdom's this project of that which may ultimately sink to more wishful thinking in the absence of adequate Central patronage and help; but it is also our duty to ask them not to play into the hands of those who are out to create chaos for the furtherance of their political aims.

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OIL EXPLORATION

The Standard-Vacuum Oil Company recently undertook explorations of oil in the Bengal Basin area. The Company's reports on these activities, however, do not portray an accurate picture of the present situation. This is the estimate recently made by the Company's General Manager, Mr. R. T. Burton. He holds that optimistic reports concerning the presence of petroleum deposits in the area, as well as those giving out the opposite view, are both premature. He says that the data collected through the magnetometer survey undertaken by the Company in 1951-52 are still being studied by geophysicists. The magnetometer is not an oil-finding instrument. It is used to find out only whether underground rock conditions are favourable for additional oil prospecting. According to Mr. Burton, even when the survey results are known they would not prove conclusively the presence or absence of petroleum in the Bengal Basin area. If the survey results indicate the presence of favourable underground rock conditions, even then more detailed investigation including actual drilling will be necessary to determine whether or not oil will be available in the area concerned. The task is very painstaking and costly. It will be foolish to take an optimistic view of things and Mr. Burton has done well in reminding that even after prolonged and expensive preliminary researches, statistics show that only one test well in ten actually strikes oil, and only one well in 40 discovers a major oil field.

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RAJASTHAN MINERALS

The Rajasthan Mineral Advisory Council held its second meeting at Jaipur in September. Rajasthan is one of the

principal mineral regions of India and mining there accounts for no less than 17 per cent. of the total mineral output in this country. The Council advocated the application of modern scientific methods for reorganising exploitation of minerals in the State and for preventing the wastage of precious mineral deposits due to crude handling. The Deputy Minister for Communications, Mr. Raj Bahadur, spoke on the need for improving communication and transport facilities and for improved power supply to put the mining enterprise in the Satate on an even keel.

The following extract from a recent issue of Bombay's Commerce throws light on the importance of Rajasthan as a mineral producing region:—

"It (Rajasthan) is the sole supplier of marble in India, its quarries at Makrana in the Jodhpur Division being well known. It is the second biggest supplier of mica in India. The average production of mica is about 22,015 cwts. per year. Rajasthan sends vast quantities of gypsum to the Sindri Fertiliser Factory. Besides these, the State possesses deposits of lead, zinc, manganese, tungsten, emerald, Fuller's earth, glass sand, soapstone, clays, kyanites, limestone, sandstone, quartziles, kankar, asbestos, calcite, sodium sulphate, salt, saltpetre solenite, felspar, beryl, ochres, gypsum and bentonite. The State is also stated to possess considerable deposits of copper, lignite, and oil the economic possibilities of which are yet to be investigated."

The Rajasthan Government's development scheme envisages opening technological institute and laboratory. The Scheme also aims at providing technical assistance to mining companies. But due to lack of finance the scheme remains unimplemented. At present, the Rajasthan Government is operating four mines as an experimental measure, a lignite colliery at Palana, wolfram mine at Degana, limestone quarry at Naila and slabstone quarry at Bhankri. The State Government is also carrying on inspections of mineral deposits and field surveys of minerals. The Government of India's Zinc Committee is reported to be investigating the possibilities of setting up a zinc smelter plant at Zawar in Udaipur Division. Private industrial interests are bestowing attention on developing sulphur and cement production as a subsidiary industry to gypsum. A plant has been set up at Bikaner by a private company to produce Plaster of Paris, we are told.

IMPROVED PRODUCTIVITY

The ILO recently sent out to India a five-man team of experts to study the possibilities of improved productivity. The experts have worked in two groups—one in the engineering industry in Calcutta and the other in the cotton textile industry in Bombay and Ahmedabad. The ILO Mission completed its work in eight months and received support from Government, managements as well as workers. The workers at first were suspicious that the team's proposed measures would lead to retrenchment, but later their doubts were laid at rest and they extended their co-operation whole-heartedly. One of the members of the team said on conclusion of his work, "The problems that India has to face are immense and complicated and they will take a long time to solve. But we have been able to show how the output can be increased measurably with the present resources and that can be regarded as a contribution to helping India surmount his difficulties. If India is to maintain the living standards of her people, production and productivity must be increased." The claim seems well justified. In the engineering industries, for example, productivity went up by 200 per cent. in some cases as a result of the application of the methods

recommended by the ILO team. Another important step taken by the team was the training of individuals, selected by managements and unions, in the fundamentals of modern methods of work, study and procedures for the improvement of efficiency and productivity. The application of work-study methods in some of the selected textile mills in Bombay and Ahmedabad yielded encouraging results, productivity having been raised by 20 to 25 per cent.

INDO-BURMESE TRADE

The projected Indo-Burmese Barter Deal has foundered for the time and its cause is alleged to be India's reluctance to buy high-priced Burmese rice. It is a pity that a responsible Burmese official is reported to have said that the recent trade talks between Burma and India had every chance of success but for the Indian Food Minister's alleged intransigence. Some of the members of the Indian Parliament did well to refer to the matter thereby giving Mr. Kidwai a chance to explain the cause for the breakdown of the Indo-Burmese trade talks. Burma has told India that if she does not buy her rice, Burma will sell it to other countries and obtain the goods she needs from them. But such a threat is uncalled for. Mr. Kidwai has made it clear that India is prepared to buy 1 m. tons of rice this year if the price is about Rs. 16 per maund. If Burma cannot afford to sell her rice at that rate, there is no reason why India should care to purchase it at a higher price. After all, the scarcity of rice within the country is no longer very acute and so we need not buy it at any price. The very fact that India is willing to buy 1 million tons of rice from Burma despite the absence of scarcity shows that we intend to restore the pattern of our normal pre-war trade relations with Burma. Again, India is ever ready to supply Burma with such articles as she needs and, to quote Mr. Kidwai, "that at a price which compared favourably with the prevailing rates in other countries." Mr. Kidwai told Parliament that Burma regarded rice as a money crop and she was quite within her rights to fix a price which would suit her. But India too is an independent country and nobody can expect her to pay a price she does not consider as suitable.

Manufacture of Liquid Gold

Liquid gold is an important article used extensively in the manufacture of glass bangles and ceramic articles for decoration purposes. Its annual consumption in India has been estimated at approximately 20,000 oz. Hitherto, this important article was exclusively imported from abroad. It is gratifying to note that after a laborious research covering a period of 3 years the Industrial Research Bureau has succeeded in working out a process of manufacturing liquid gold equal to the best German product. That there should be no difficulty in manufacturing liquid gold in India, and that the manufacture would be profitable is suggested in their Bulletin No. 16 "Manufacture and Application of Liquid Gold." An extract from this Bulletin is given here for the benefit of our readers.

In liquid gold, the gold and the other necessary metals are present in the form of resinates, which can be prepared either by interaction between the metal chloride and the sulphur-turpentine compound or by heating together the oxide of the metal with Venetian turpentine at the boiling point of the latter. The mechanism of the reaction of sulphur with turpentine at the boiling point of the latter is not yet clearly understood, but it is believed that an additive compound of turpentine with sulphur is formed at this temperature.

The presence of minor constituents such as bismuth chromium and rhodium resinates, has an important bearing on the physical properties of liquid gold. The function of bismuth resinate, which forms bismuth oxide on burning, is to fasten the gold film to the glass or porcelain surface to which it is applied. Chromium resinate present in liquid gold plays a role probably similar to that of bismuth resinate. The chief function of rhodium resinate is, however, to make the film of metallic gold lustrous.

Brief descriptions of the methods of preparation of each of the constituents of liquid gold will first be given before the final compounding of the product is discussed. The quantities of materials and the size of apparatus described below are those required to prepare a batch of liquid gold starting with 20 tolas (233.3 gms.) of metallic gold.

SULPHUR TURPENTINE COMPOUND

In a distillation flask (capacity 4 litres) a mixture of venetian turpentine, turpentine and sulphur in the following proportions is heated on a sand bath at about 170°C.

Venetian turpentine	450	gms.
Turpentine	850	"
Flowers of sulphur	120	"

Turpentine, which begins to distil at this temperature, is collected in a receiver which may conveniently be a distillation flask. In order to facilitate the distillation of turpentine, the receiver should be connected to a water pump and a few holes board in the cork fitted to the distillation flask containing the mixture, so that the turpentine vapours will be sucked into the receiver with a current of air and the distillation flask remains at normal atmospheric pressure. The rate of distillation should be so adjusted that about 60 gms. of turpentine distil in one hour. After 250 gms. of turpentine have distilled over the heating is discontinued, and the distillation flask allowed to cool slowly. The dark brown viscous liquid which remains in the flask is the sulphur turpentine compound, used in the preparation of most of the metallic resinates present in liquid gold.

GOLD RESINATE

Metallic gold is first beaten and rolled into thin sheets and then cut into small pieces with a view to facilitating its solution in aqua regia. 20 tolas (233.3 gms.) of the metal pieces are dissolved in a mixture of 1000 c.c. of concentrated hydrochloric acid and 400 c.c. of nitric acid in a porcelain dish. After complete dissolution of the metal in the acids, the solution of gold chloride should be filtered in order to remove any silver chloride which may have formed as a result of the presence of silver as an impurity in the gold, and to the clear solution of gold chloride so obtained are added 150 gms. of potassium chloride dissolved in about 300 c.c. of distilled water, after which the whole mixture is evaporated to dryness on a waterbath. The orange yellow crystals of potassium-auric chloride so formed should then be dissolved in about two kilogrammes of pure methyl alcohol and filtered to remove the unreacted potassium chloride. This solution of potassium-auric chloride in methyl alcohol is then ready for the preparation of gold resinate.

One kilogramme of the sulphur-turpentine compound is added slowly to the solution of potassium-auric chloride, the rate of admixture being so adjusted as to avoid an excessive rise in temperature. After complete mixing of the contents, the container and the contents should be weighed, and then heated on a water-bath till the weight is reduced by 1600 gms. To ensure rapid evaporation of the methyl alcohol, the mixture should be occasionally stirred during heating. Instead of evaporating off the alcohol, it may be recovered, fractionally distilled and purified for re-use, but owing to the fact that it carries with it a cerain amount of turpentine compounds, its purification is more difficult than is ordinarily the case.

The thick mixture of gold resinate and unreacted sulphur-turpentine compound should next be dissolved in 1000 gms. of pure chloroform, and the solution neutralised with about 150 gms. of pure sodium carbonate, added gradually till the reaction becomes faintly alkaline to litmus. To ensure complete neutralisation, the contents should then be left for about twenty-four hours and the solution tested once again for acidity with litmus paper. More sodium carbonate should be added if it is still found to be acidic.

The chloroform solution is next filtered to remove the potassium chloride, excess of sodium corbonate, and any gold metal which might have been formed during the reaction. The residue on the filter paper should be washed with chloroform several times to remove as much of the soluble gold resinate as possible, the residues from this as well as other subsequent operations being kept aside for the recovery of the gold content.

In order to obtain pure dry gold resinate, the filtered chloroform solution is added drop by drop to 3 kilogrammes of methyl alcohol which is kept continually stirred, and in this way the gold resinate is precipitated. The precipitated resinate is filtered and washed thoroughly with methyl alcohol, after which it is dried by spreading the filter paper at room temperature, and the dried resinate finally powdered and kept in a well stoppered bottle.

Great care must be taken in the preparation of the gold resinate, as otherwise the liquid gold made from it will be deteriorated on storage for even a few days such deterioration in quality will result in the deposition on the article decorated of a film of dull appearance having a reddish brown tinge and nonuniform texture. Sometimes the deterioration takes the form of rendering the dry resinate insoluble.

This deterioration is most probably caused by decomposition of the resinate

owing to the presence of minute traces of impurities which remain absorbed in the gold resinate during preparation. The precautionary measures that need to be taken to avoid such decomposition are, firstly, prevention of the dust from the gold resinate, and, secondly, washing of the precipitated resinate very thoroughly with methyl alcohol before drying. The washing of the resinate with methyl alcohol should be carried on till the filtrate is colourless. Once the dried resinate has been freed from impurities, it keeps well and the liquid gold prepared from it does not show any sign of deterioration.

In order to recover the gold which remains in the washings, filter paper, residues, etc., the latter are collected together and burnt to destroy the organic matter, and after complete combustion the mass is lixiviated with water and filtered to remove most of the soluble salts such as sodium carbonate, and potassium chloride. The residue is dissolved in aqua regia, as a result of which all the gold goes into solution together with bismuth oxide, etc., and from this solution the pure metallic gold is precipitated (in the form of a fine brownish powder) by adding sulphurous acid or by passing sulphur dioxide into it, leaving the impurities behind in solution. The recovered gold is washed and can then be again used for the preparation of gold resinate.

BISMUTH RESINATE

Bismuth oxide, which is employed in the preparation of this resinate, may first be prepared from bismuth nitrate as follows:—

100 gms. of the bismuth nitrate are dissolved in 200 c.c. of water containing 20 c.c. of concentrated nitric acid, and the solution then heated on a water-bath. To this solution is next added 90 gms. of pure potassium hydroxide dissolved in 100 c.c. of hot water. An orange yellow precipitate of bismuth oxide is produced thereby, and this should be washed free from alkali and dried in an air-oven at about 70°C.

To prepare the bismuth resinate, 50 gms. of the dry bismuth oxide are mixed with 150 gms. of fresh Venetian turpentine and the mixture heated on a sandbath for forty-five minutes, the temperature being carefully controlled so as not to exceed 160°C. This is then dissolved in about 100c.c. of chloroform, thoroughly shaken, and filtered to separate the unreacted bismuth oxide. The bismuth resinate is precipitated from the chloroform solution by adding it drop by drop to 400 c.c. of methyl alcohol which is continually stirred. The resinate is finally filtered, dried at room temperature, powdered and stored in a stoppered bottle.

CHROMIUM RESINATE

The starting material for the preparation of this substance is chromic acid, 5 gms. of which should be dissolved in 10 c.c. of water in a porcelain dish, and to this should be added 16 gms. of the sulphur-turpentine compound, the mixture *being stirred continually*. A considerable rise of temperature will be found to take place due to the oxidation of the turpentine compound by chromic acid. After about half an hour, the mixture is heated on a water-bath to remove the water as far as possible, the loss in weight being about 8 gms. The partially dehydrated mixture is then dissolved in 30 c.c. chloroform and the solution subsequently filtered to separate the chromium resinate from the chromium oxide formed during the reaction. From the chloroform solution, the resinate is precipitated by adding the alcohol, which should be stirred continually during the operation. The resinate is finally filtered and dried at room temperature, after which the dried resinate, which is dark gray in colour, should be *powdered and stored in a well-stoppered bottle.*

RHODIUM RESINATE

The starting material for the preparation of this resinate is sodium-rhodium chloride a double salt of rhodium and sodium chloride having a rhodium content of 16-17%. To prepare the resinate 100 gms. of this salt are dissolved in 50 c.c. of distilled water and to the resulting bright red solution are added 12 gms. of barium hydroxide dissolved in 20 c.c. of hot water, whereby brick-red coloured rhodium hydroxide is precipitated. Without filtering the precipitate, the whole mixture is next heated on a waterbath until perfectly dry, at which stage the rhodium hydroxide assumes a dirty colour. It is then washed with hot water to concentrated hydrochloric acid, when it will assume a brilliant rose ruby colour. The solution of the chloride should then be evaporated on the water-bath to remove the excess hydrochloric acid and when fumes cease to be given off it is dissolved in 60 gms. of methyl alcohol.

To prepare the rhodium resinate, 50 gms. of sulphur-turpentine compound are added to the methyl alcoholic solution of rhodium chloride, while continually stirring, and after about half an hour the methyl alcohol is evaporated from the mixture to the extent of 50 gms. The mixture, consisting of rhodium resinate and unreacted sulphur-turpentine compound, is dissolved in chloroform, just sufficient in quantity for the purpose. It may be found to contain some hydrochloric acid set free during the reaction, and this must be neutralised, the chloroform solution being, therefore, shaken thoroughly at this stage with 10 gms. of sodium carbonate, after which it should be left for twenty-four hours to ensure complete neutralisation. The neutralised solution should then be filtered and washed with some more chloroform, after which the filtrate is added, drop by drop, with continuous stirring, to 300 gms. of methyl alcohol to precipitate the rhodium resinate, which will be rose-red in colour. The precipitate is washed well with methyl alcohol and allowed to dry at room temperature by spreading the filter paper, after which the dry resinate shoud be powdered and stored in a well-stoppered bottle.

ROSIN SOLUTION

Rosin solution is used for adjusting the gold content of liquid gold to the usual commercial proportion which is generally 12. 1%. To prepare this solution, 200 gms. of powdered rosin (ash content not more than 0.05%) are dissolved in 135 gms. of turpentine, with the aid of slight warming on a water-bath. The solution should be allowed to settle for about three days, and during this time it must be kept well covered to avoid dust particles. The clear supernatant liquid is finally decanted off and stored in a stoppered bottle.

BITUMEN SOLUTION

This solution is used to adjust the consistency and gold content of the liquid gold. Incidentally it also imparts a darker shade to the product. For its preparation 50 gms. of pure bitumen are dissolved in about 100 gms. of chloroform and refluxed for about half an hour on a water-bath. On cooling, the solution is filtered to separate any impurities that may be present, after which 50 gms. of nitrobenzene are added to the filtrate and the mixture heated in a beaker on the water-bath to remove the chloroform. When there is no more smell of chloroform the solution of bitumen in nitrobenzene is removed from the water-bath and placed for storage in a stoppered bottle.

COMPOUNDING OF LIQUID GOLD

When all these constituents are available, the required final product is prepared

by combining them in certain proportions. After a large number of trials of mixtures containing the components in varying proportions, the following mixture has been found to be the most satisfactory:—

Gold resinate.	Resinate	containing	100 gms. of metallic gold.
Rhodium ,,	,,	,,	0.55 gms. of metallic rhodium.
Chromium ,,	,,	,,	0.45 gms. of Cr_2O_3.
Bismuth ,,	,,	,,	2.5 gms. of Bi_2O_3.
Ilaichi oil	,,	,,	230 gms.

The mixture of the dry resinates should be ground with ilaichi oil in a porcelain mortar, so that it becomes perfectly homogeneous, care being taken to avoid dust particles, as these adversely affect the storage properties of the final product. When the mixture is ready it is mixed with a separately prepared mixture of rosin and bitumen solution having the following composition:—

Bitumen	95 gms.
Rosin solution	285 gms.

When the final mixture has been thoroughly homogenized, the ash content (metallic gold and other metals) should be checked by igniting a sample of known weight at a temperature not higher than 700°C. The ash content should be approximately 12.5 per cent. corresponding to metallic gold content of 12.1 per cent. to 12. 2 per cent. If the ash content is more than this, an additional quantity of oil requires to be added to bring the gold content to the desired proportion.

The mixture should then be allowed to settle under cover for about two days, so that any undissolved particles which may be present can settle. When adjusting the oil content, allowance should be made for the oil which may be lost by evaporation during settling. After settling, the liquid gold is carefully decanted and bottled.

Application of Waxes in Photography

Beeswax, paraffin, and certain mineral waxes are extensively used in various photomechanical processes.

An early employment of wax, in this direction, was for the production of so-called "artificial" (fictitious) negatives, or those made by engraving line designs in an opaque or nonactinic wax coating on a transparent glass plate. The image so produced can then be used as a "negative" for exposure on sensitized paper, glass, or metal.

For protection of photographic equipment, particularly darkroom benches and plateholders, used in set wet collodion process, coatings of wax or paraffin offer a surface impervious to the corrosive silver nitrate solution employed with collodion plates.

Beeswax and paraffin wax also are used for transparentizing or rendering translucent the support of paper negatives, the added transparency reducing the time of exposure of line and halftone negatives when used for contact printing in photolithography and kindred processes. For this purpose, the wax can be applied to th paper base with a hot iron, though a more convenient procedure is to apply a solution, consisting of one ounce of white wax dissolved in five ounces of hot turpentine.

For production of photographic prints,

possessing a surface of high gloss, and for drying of photogravure carbon tissue, after sensitization in bichromate baths, it is usual to apply the wet surface to glass or special ferrotype plates of japanned iron or chromium-plated steel. To prevent sticking of the print or tissue to these surfaces, after drying, the plates are sometimes coated with paraffin wax, using a solution of ten grains of paraffin in one ounce of benzol or carbon tetrachloride.

The use of waxes, in printing inks, is well known, but such materials also are employed in special inks for photomechanical platemaking, either because of their acid-resisting properties in photoetching methods, or because of their greasy nature, the latter a requisite in photolithography. An etching or "starting" ink, for rolling up bichromated albumen ("ink top") exposures on zinc and copper for relief halftone and line etching (photo engraving), may consist of this simple formula:

Black Letterpress Ink	4	parts.
Beeswax	4	,,
Thin Litho Varnish	1	,,

These ingredients are melted together, then thoroughly ground.

A " soft " etching ink for photoengraving comprises:—

Black litho ink	8	parts.
Tallow	3	,,
Asphaltum	1	part.
Thin Litho Varnish	8	parts.
Beeswax	3	,,

First melt the solid ingredients, then add the litho varnish; when cool, work well with a muller and ink slab.

A "finishing" ink for rolling up the plate prior to the final "bite" or etching period is composed of:

Black litho ink	8	parts.
Beeswax	4	,,
Rosin	2½	,,

Add sufficient turpentine to give desired working consistency.

Special acid-resisting inks are employed for rolup procedure in halftone zinc etching, the following being an indication of their composition:

Black letterpress ink	8	parts.
Asphaltum	2	,,
Rosin	1½	,,
Beeswax	1½	,,
Turpentine	5	,,

The etched plate must be warmed to a proper degree before applying the ink, the contained heat then causing the applied ink to melt and run down the sides of the partially etched dots.

For staging of halftone plates during relief etching, fluid inks of acid-resisting nature are locally applied so that the remainder of the plate may be further etched to obtain correct tone values. An ink for this purpose may contain:—

Asphaltum, powdered	4	parts.
Turpentine	6	,,
Benzol	6	,,
Beeswax	2	,,
Dragon's blood	2	,,

Processes of "mechanical staging" have been devised for relief halftone etching on zinc and copper, such processes aiming to dispense with staging in favour of applying a waxy composition to the partially etched plate. A representative of this type is:

Petrolatum	8	parts.
Beeswax	8	,,

The ingredients are melted and enough printing ink added to impart a black colour to the mixture. The final composition is rubbed into the plate, after the first (flat) etch, and the plate then rubbed with fine sawdust, leaving the middletones and shadows of the image more or less protected by a greasy layer of composition.

In the matter of etching powders, mineral waxes have been proposed as a partial substitute for natural resins, and at

least one such "synthetic" has been offered to the American photoengraving trade.

Opaquing of images is a necessary operation in photomechanics, not only for the elimination of pinholes and other blemishes in the image, but also for partial obliteration of parts of the image, such as is sometimes required in colour reproduction. A popular material, for this purpose, is that known as "turpentine opaque", containing the following:

Turpentine	2½ oz.
Asphaltum	¼ ,,
Beeswax	40 gr.
Carbon Black	20 ,,

The wax is dissolved in the turpentine by heating, after which, the asphaltum is added, finally stirring in the carbon black.

For correction of photolithographic halftone image, in colour reproduction, recourse is had to dot etching procedure, wherein the halftone negative or positive is staged during etching, following along the principle of halftone relief etching. A number of solutions have been proposed for staging on plates and films, and entailing the use of wax:

Asphaltum powdered	50 parts.
Venetian Turpentine	20 ,,
Yellow beeswax	15 ,,
Turpentine	150 ,,

Dissolve by heating the mixture, but do not boil off the turpentine.

In photolithography, a fluid (developing) ink is used for imparting a greasy foundation to bichromated albumen images on grained zinc and aluminium. such inks are articles of trade, though a suitable substitute can be had from the following, all ingredients of which contain wax in some form:

Transfer ink	4 parts.
Black letterpress ink	4 ,,
Etching ink	8 ,,

The materials are ground in sixteen ounces of oil of turpentine, to which have been added twenty drops of oil of lavender to provide a more agreeable odour to the final ink. For use, the mixture may be thinned with rectified turpentine to the consistency of heavy cream.

For inking up images on photolitho transfer paper, a stiffer ink is required, such as the following:

Palm oil	1 part.
Beeswax	1 ,,
Asphaltum	2 parts.
Burgundy pitch	2 ,,
Black litho ink	8 ,,
Litho varnish	2½ ,,

If desired, the ink can be thinned by working up with litho varnish.

Work can be introduced on litho plates by drawing or painting with litho crayons or tusche. A simple formula for the required grease crayon is:

Lampblack	2 parts.
Soap	4 ,,
Wax	4 ,,
Spermaceti	4 ,,

The materials are melted together and the mass then poured into paper moulds in pencil form.

Like crayons, litho tusche is an article of trade, the following formula giving an idea of its composition:

Yellow wax	2 parts.
Mutton tallow	2 ,,
Marseilles soap	6 ,,
Shellac	3 ,,
Lampblack	1½ ,,

The tusche should dissolve fairly easily in distilled water, and the resulting liquid should flow freely from brush or pen. Liquid tusches are supplied commercially; they differ in principle from the above formula merely by having the materials ready dissolved in water or other solvent.

Washout solutions are preferred by some lithographers for strengthening the

image or design, prior to its use on the litho press. An old formula for a washout solution is:

Asphaltum, powdered	6	parts.
Mutton tallow	3	„
Yellow wax	1	part.
Turpentine	40	parts.

The ingredients are dissolved in the turpentine by the aid of heat, and a thin film of the cool solution allowed to dry on the litho printing surface.

Both beeswax and paraffin wax have been suggested as dampprotectors for engraved steel plantes, their presence preventing the formation of rust. Although either substance can be used separately for the purpose, some engravers prefer a coating containing equal parts of beeswax and paraffin wax, on the score that paraffin does not absorb oxygen and, therefore, retards exidation of the stored plates.

Purification of Fats and Oils

The raw fat or oil obtained by any method of preparation is rarely chemically pure. By working on perfectly fresh, raw material, however, and taking extreme precautions to render or extract low temperatures, it is possible to obtain a portion of the fat or oilcontained in the material of a high degree of purity. But this is not often possible, is at all times somewhat costly, and is only necessary when the fat is intended for some special purpose, such as the manufacture of edible oils, or butters.

In the great majority of cases the raw fat contains impurities of a more or less deleterious nature, which must be subsequently removed by submitting the oil to a process of refining.

Then purification of the fats and oils is one of the most important and difficult problems in the industry, and is only rendered possible by a knowledge of the nature and properties of the impurities. It is impossible to devise any specific process of refining which shall be applicable to all cases, but each problem must be dealt with on its own merits. At the same time, however, broad definite methods of refining can be indicated, since the same kind of fat obtained in the same way always contains similar impurities. The degree of purity which it is desired to attain will depend in all cases, of course, upon the uses to be made of the refined article. For example, burning oils must be free from inorganic matter, which causes the wick to char, edible oils and fats must be devoid of unpleasant odour or taste, while oils intended for use in the soap industry must not contain excessive quantities of unsaponifiable mater, although free fatty acids are no objection.

The impurities have their origin in three chief sources :—

(1) The process of obtaining the oils.

(2) The apparatus employed.

(3) The faulty storage of the seeds, tissue or crude oil.

(1) The quantity and nature of the foreign matter introduced by the process of extracting the oil varies somewhat with the particular method employed.

In the "rendering" of the fat, easily decomposable products are formed—fatty acids, acrolein, hydrolytic products, not only of the fat, but also hydrocarbons, etc., from the proteins, all of which dissolve in the molten fat and impart to it objectionable odours, tastes and colours.

In the "expression" process the oil becomes charged with the watery fluids of

the cells, which are pressed out at the same time, and also with the protein constituents of the plant or animal. The extraction by solvents process yields a product containing practically no mechanical impurities, but since the solvent can dissolve dyes and odoriferous principles, the extracted fat is not free from colour or flavours. Further, the solvent action of different solvents for such foreign matter is variable, and consequently the same fat when extracted solvents is obtained in varying degrees of purity.

(2) The free fatty acids which occur in all raw oils and fats act upon the metal walls of the tanks, presses, pumps, etc., forming metallic soaps, which dissolve in the oil. At the same time bits of filter cloth, press bag, and abrasive metals from the extraction plant, mingle with the oil.

(3) During storage, particularly if insufficient care, attention be paid to the proper ventilating, drying, etc., of the storehouse, the oil becomes rancid. A satisfactory refining process can only be devised when the nature of the impurities, and the way in which they are present with the oil, is known. We shall, therefore, consider these factors at some length. The impurities, which are either (a) mechanically mixed or emulsified, or (b) dissolved in the oil, may be broadly divided into two classes, namely, (1) organic and (2) inorganic substances.

Among the organic, the more important are proteins, carbohydrates, gums, resins, enzymes, soaps, glycerine, lecithin, and hydrocarbons, while among the inorganic, one has to deal with water, metallic salts, etc.

The proteins may be divided into three classes, simple proteins, conjugated proteins, and albuminoids, all of which may be present in the crude oil. In general the proteins are soluble in water, better in dilute saline solutions. All proteins exhibit a tendency to coagulate, the coagulated body generally being insoluble. This coagulation is brought about by heat, the action of mineral acids, and concentrated salt solutions, best of which is ammonium sulphates. A most important representative of the conjugated proteins, which occurs in many oils, is the compound mucine, which is a compound of a simple protein with a carbohydrate. Compounds like this possess a powerful emulsifying influence and their presence in a raw oil is indicated by the formation of persistent emulsions, when the oil is shaken with water.

The albuminoids are a group of substances similar in some respects to the proteins.

The albuminoid collagen is the substance of which the white fibre of connective tissue is composed, and may be expected, therefore,to be mixed with oils obtained by pressing animal tissue.

It is not quite certain whether the proteins are dissolved in the oil in the true sense of the term, but it is probable that they are present in the form of pseudo solutions. From the above description, the most satisfactory methods of removing the proteins will be gathered. The object in all cases being to render them insoluble in the oil, and then remove them. This may be brought about, as we shall see later, by warming, or by treating the oil with concentrated salt solutions or mineral acids, all of which methods result in a more or less perfect coagulation of the proteins. The precipitating proteins always bring down with them the bulk of the suspended impurities.

The vegetable and animal gums are carbohydrate-like bodies, very prevalent in linseed and other oils. These substances are soluble in water, are powerful emulsifiers, and inhibit the precipitation of metallic hydrates by alkalies; they may

be removed, however, by treating the oil with alkali or washing out with salt solutions. It is important to notice that precipitates in gummy solutions show colloidal characters, and so cannot be separated by filtration.

FERMENTS AND ENZYMES

These substances, which are of a protein-like character, are powerful catalysers, hydrolysing or oxidising the oil according to their specific property.

Among the more important enzymes which have been detected in oils are lipase, a most powerful fat splitting enzyme occurring in castor seeds, and myrosin emulsing in mustard seed oil.

In olive oil the oxydase olease has been detected. It is capable of converting olive oil slowly into CO_2 acetic and sebacic acids. All enzymes are killed at certain temperatures and also by strong acids or alkalies. Soaps, free fatty acids, glycerol, lecithin, (a phosphorus compound) and resins are present in varying amounts in the crude oil, from which they may be separated by treatment with water and alkaline solutions.

The lipochromes, chlorophyll, etc., are nearly always present, and may generally be destroyed by bleaching. Our knowledge of the constitution of the flavour and odoriferous substances present in the oil is but vague.

INORGANIC IMPURITIES

Some oils, especially linseed, can directly dissolve salts, but, as a rule, the inorganic material is dissolved in the water which is intimately mixed with the oil.

Quite apart from the importance of purifying the oils for technical purposes, a refined oil deteriorates much less on storage than an impure oil, since enzymic action, which is assisted by the presence of water, brings about slight hydrolysis and decomposition of the fat or oil.

The methods of purification have for their object—

(1) The removal of mechanically-mixed substances.

(2) The dissipation of emulsions.

(3) The removal of dissolved impurities.

(4) The removal of free fatty acids.

(5) Bleaching and removing objectionable odours.

Mechanical impurities may frequently be removed by simply allowing the oil to stand in a warm tank for two or three days, when the grosser particles fall out, and are deposited at the bottom as a precipitate. If, however, the particle in suspension is very fine, and the oil viscous, precipitation will not take place for an immense period of time. In such cases one aims at either producing a precipitate in the oil or filtering through earth. The former case is particularly interesting, and illustrates a phase of surface action.

The suspended particle is attracted towards the grosser particle of precipitate, and so a large aggregate is formed, readily acted upon by gravity, and consequently quickly falling. The substances employed for producing this effect may be oilcake meal, fuller's-earth, kieselguhr, aluminium hydrosilicate, or animal charcoal, all of which substances exert this surface action. The power is thoroughly mixed with the oil, and the mixture then allowed to stand until separation occurs, or filtered free from the precipitate.

EMULSIONS

An emulsion is a mixture of two immiscible liquids, in which one of the liquids is distributed throughout the other in the form of fine drops. The emulsions with which we have to concern ourselves are formed from fine drops of water, or saline solutions suspended in oil. Such emulsions show, little or no tendency to settle, and are always dull and opaque.

Without going into detail on the nature of emulsions, we may point out that this again is a phenomenon of surface action, depending upon the relative surface tensions of the two liquids towards one another, the emulsion being stable until a certain change is brought about in these relative tensions. The most frequent emulsifiers are soaps, alkalies, gums, and mucines. It is almost impossible to dissipate an emulsion by simple filtration, unless the filtered material is composed of hydroscopic substances. Occasionally it suffices to warm and blow air through the heated oil, but more satisfactory is treatment with an acid.

SUBSTANCES DISSOLVED BY THE OIL

The removal of impurities of this class can only be effected on a practical scale by treating the oil containing them with reagents, which render them insoluble in the oil. The most suitable reagent for this purpose is concentrated sulphuric acid, which attacks soluble proteins, resins, gums, etc., decomposing them and forming a charred product no longer soluble in the oil. The process is carried out as follows:—

To the cold oil contained in a lead-lined vat, provided with mechanical agitators, about 1 per cent. of its weight of concentrated sulphuric acid of 66°Be. is slowly added with constant agitation. The mixture is thoroughly stirred for from 1½ to 5 hours, then allowed to rest, and the acid layer drawn off (foots). The oil is then washed free from acid by water, the water drawn off, and the oil allowed to stand to clarify. The effect of the acid is to decompose soaps and proteins. break down emulsions, and destroy enzymes and ferments.

The acid foots drawn off are a thick viscous mass, containing besides the impurities, some fat and sulphonate fatty acids.

On boiling with water the sulphuric acid is removed, and these substances float on the surface, may be skimmed off, and subsequently treated for the preparation of commercial products.

At the same time, the sulphuric acid attacks the oil to a slight extent, forming sulphuric acids, which decompose in the subsequent treatment with hot water, into hydroxy acids.

If the acid refining is wrongfully carried out, i.e., at too high a temperature, or too great a concentration of acid, the resultant oil is dark coloured, an error which cannot be remedied by bleaching.

Somewhat similar results can be obtained by the use of other dehydrating agents, such as anhydrous zinc chloride.

REFINING BY BASIC REAGENTS

Of equal importance to the sulphuric acid is the treatment with concentrated solution of alkalies, the most usual being caustic soda, a process introduced by Gwynne in 1843, and improved by Evard in 1855. The effect of this reagent is on the one hand, like sulphuric acid, to decompose and remove proteins, etc., but, at the same time it forms soaps with the free fatty acids and resins which dissolve in the aqueous solution, and so are drawn off.

This process is also of value in removing suspended matter, since the soaps are formed throughout the oil in flocks which enclose and bring down the particles.

Two methods of procedure are employed: (a) treatment with concentrated lyes, (b) treatment with dilute lyes.

In the former case it is customary to employ about 2 or 3 per cent. of lyes of 36°Be., while in the latter case over 10 volumes of lyes per 100 volumes of oil of 12°—15°Be. is employed. In all cases, however, the quantity and concetration of lyes needs modifying according to the purity of the raw oil. The

mixing is effected at 40° — 50°C., and when the action is judged to be complete the mass is allowed to stand until separation occurs. The under layer of caustic lays containing the soaps and other impurities, is withdrawn, and there remains a slimy intermediate layer, above which floats a more or less clear oil: the intermediate layer is allowed to subside, as far as possible, and is in some cases assisted by centrifuging the mass. The supernatant oil is washed with water until free alkali, in so adjusting the various factors that, while complete purification is attained, minimum saponification of the fat shall occur, and the formation of persistent emulsions be avoided. To obviate this latter difficulty it has been suggested to mix common salt with the lyes, since this tends to hinder emulsification. It is not usual, however, to adopt this procedure, since a perfect mixing or emlusification of the oil and lyes, in the first case, is essential, and it is always possible, by choosing suitable concentrations, to attain a more or less rapid separation on standing. Various modifications, more or less of a transitory nature, such as conducting the process under pressure of an indifferent gas, or the employment of ammonia, are occasionally employed.

By far the largest quantity of oil on the market is refined by the caustic alkali treatment, but where the removal of free fatty acids is the chief consideration, it is possible to employ lime or magnesia in place of caustic, and to remove the resultant insoluble soaps by passing the mixture through a filter press.

The alkaline liquors (foots) contain a quantity of soap and oil which is recovered by acidifying and then removing the fatty layer which rises to the surface. Where both acid and alkali refining is carried out in the same works it is customary to mix the acid and alkali foots to produce a neutral or faintly acid mass, from which the fatty matter readily separates.

BLEACHING AND REMOVING OBJECTIONABLE ODOURS

Raw fats and oils which owe their colour to the presence of naturally-occuring lipochromes, may generally be bleached to a fine whiteness. Two methods are employed, namely (a) absorption of the colour stuff, (b) destruction of the colour.

If a solution of colour stuff in water is shaken with fine earth or charcoal, and then allowed to stand until the solid matter subsides, it will be found that a quantity of the colour stuff has left the solution, and "adsorber" on to the power.

In the same way the colour stuff which is dissolved in an oil or molten fat, may be removed, by shaking with a powder. The decolourising powders usually employed are blood, charcoal, Kieselguhr, china clay, and Florida earth (aluminium magnesium hydrosilicate).

During the process of treatment with sulphuric acid, or caustic lyes, a certain amount of colour is destroyed, but a more perfect bleaching is ensured by treating the oil with either direct or indirect oxygen. In some cases the destruction of the colour stuff may be brought about by blowing air through the oil, heated to about 100°C. This is the process in which the colour is destroyed by the oxygen of the air. Similar bleaching action ensues in some cases when the oil is submitted in thin layers to the action of the air ,in the presence of strong sunlight, a process of natural bleaching once largely employed in the preparation of the colourless varieties of linseed oil.

The chemical mechanism of this process appears to consist in the intermediate formation of ozone, or hydrogen peroxide, by the action of ultraviolet light on oxygen of the air mixed with water vapour. The process, however, is slow

and expensive, and has been almost entirely superseded by the employment of chemical oxidising agents. Of these two types are employed, on the one hand, the peroxides of the metals, to which has recently been added a number of organic peroxides (benzoyl peroxide, acetyl peroxide, etc.), while on the other hand, advantage is taken of the inorganic bichromates, and permanganates which liberate nascent oxygen when treated with acids. Chlorine obtained from chloride of lime by treatment with acid is also employed, the chlorine liberating oxygen from the water.

The bichromate bleach, which is the most general process, is carried as follows:—

For each 100 lbs. of oil about 1 lb. of bichromate is employed. The bichromate is dissolved in 3—4 times its weight of water and the calculated quantity of sulphuric acid previously diluted to about 20 per cent. strength is added to the solution.

The oil and liquor is mixed thoroughly for ½ to 1 hour and the finely divided emulsion then left to separate.

After drawing off the spent liquor the oil is washed well with warm water until free from acid and allowed to clarify.

It is important to conduct the operation at as low a temperature as possible in order to avoid attacking the oil itself.

The bleach by chloride of lime is similarly conducted, the dilute solution of chloride in acidulated water being intimately mixed with the oil when the two reactions indicated by the equations go on side by side.

Occasionally it is found to be impossible to bleach an oil or fat by either chemical or physical processes, owing to the extreme inertness of the colouring matter. In such cases it becomes necessary to saponify it and the distil the fatty acids in steam, whereby good white products can usually be obtained equally valuable for many purposes as the original glycerides.

Objectionable odours which are usually due to the presence of volatile matter can generally be eradicated by boiling the oil with water, dilute alkaline solutions, or blowing low pressure steam through it. Many oil can be partially deodorised by agitating with the usual filter or bleach materials, but others again, notably the fish oil, retain their unpleasant smell most persistently. The peculiar fishy odour of most marine animal oils appears to be due to the presence of quite minute amounts of amines and organic phosphorous compounds. So far it has not been practical to remove this smell by the ordinary methods, but the solid products obtained by catalytic reduction of fish oils are almost odourless.

It will be gathered from the foregoing remarks that each reagent or purifying process brings about a number of effects besides that for which it was primarily employed. For example, alkaline lyes not only remove free acids, but also destroy ferments and coagulate proteins, while sulphuric acid withdraws any water which may be present in addition to its other action. Now each individual raw oil contains its own special kind of impurities, and when one knows the nature of these foreign bodies it is easy to postulate how many of the impurities could be removed once by each of the standard processes and reagents described; that operation will then be selected which can remove the greatest number of impurities in one step with the minimum injury to the oil.

Milk and Its Food Value

The food value of milk is better understood than that of any other product. *Although designed by nature to meet the nutritional requirements of the growing newborn, milk has found a place also in the diet of older children and adults.* Practical experience, as well as research, has revealed that milk, more than any other food, meets the nutritional needs of the growing body. To be complete in all respects a food must support optimum growth, provide for maintenance and reproduction, and maintain health, in so far as resistance to disease is dependent upon diet.

Although nutritional studies have revealed certain deficiencies in milk, they have in no way altered its position as the most nearly complete natural food available. It is reported that rats fed on a whole-milk diet did not grow well and developed anemia because of the low iron intake. However, when the whole milk diet was supplemented with iron and copper salts, no anemia was observed. Milk supplemented with iron did not result in an increased concentration of hemoglobin. It has been found by investigation that both copper and iron are necessary elements in the nutrition of the animal body. Cobalt also is essential for maximum hemoglobin regeneration, but milk is probably deficient in this element.

It has also been demonstrated that milk is deficient in iron, copper, and manganese; copper and manganese are essential for maintaining the hemoglobin content of the blood at a normal level. The iron and copper content of milk can not be increased by feeding iron and copper salts to the cow. Aside from its deficiency in iron, copper, manganese, and cobalt, milk is known to be deficient in certain *vitamins, notably C and D. The vitamin C content is variable, dependning upon the cow's ration* and the method of handling the milk. Raw milk is probably the best natural source of riboflavin and is a good source of the other vitamins of the B, and probably some of the other vitamins B-complex. However, thiamin, or vitamin of the B-complex are destroyed to some extent by pasteurization.

In order to discuss milk as a food in the light of recent knowledge of nutrition, it is logical to begin with a discussion of the nutritional qualities of its constituents.

MILK FAT

Until recently milk fat was considered primarily a source of energy and of vitamin A. However, in 1929 Burr and Burr discovered that certain highly unsaturated fatty acids which the body does not have the power to synthesize are essntial in nutrition. In order to prove more specifically that the essential fatty acid was not oleic acid, Burr and Burr fed various fats to rats which had developel the typical low-fat disease. Their results show that linoleic and linolenic acids are effective in curing the fat-deficiency disease. Their results further indicate that butterfat cotains the essential unsaturated fatty acids in sufficient quantities to cure the low-fat disease in rats when used at the rate of 3 per cent in the diet. Butterfat contains rather small amounts of these acids (0.17-0.25 per cent linoleic and 0.07-0.17 per cent linolenic). In a study of the comparative nutritive value of butterfat and certain vegetable oils, Schantz, Elevehjem, and Hart found that good growth was obtained in rats on a diet of 4 per cent butterfat, corn oil, coconut oil, or soyabean oil homogenized into mineralized skim milk.

However, the rats on the butterfat diet made better and more efficient gains during the first 2 or 3 weeks of the experiment than those fed the vegetable oils, although all diets were supplemented with every known vitamin. The investigation concluded that the growth-stimulating property was in the saponifiable fraction of the butterfat, since it was found that feeding the nonsaponifiable fraction along with corn oil or cocoanut oil did not give the same response as was obtained with butterfat. Because of its high digestibility, its vitamin A potency, and its flavour, milk fat is not surpassed in total nutritive value by any other fat.

MILK CARBOHYDRATE (LACTOSE).

The only carbohydrate present in milk is lactose. Lactose is unique in that it is found only in milk, whereas other types of sugar are fairly widely distributed in nature. Liberal quantities of lactose in the diet produce a favourable medium in the intestinal tract for the establishment and growth of Lactobacillus acidophilus. These organisms favour carbohydrate fermentation, which in turn results in an acid condition in the intestinal contents unfavourable to protein putrefaction.

For some time it has been known that lactose favours calcium assimilation. Bergeim was able to demonstrate that adding from 25 to 50 per cent of lactose to the diet of rats led to a pronounced increase in the amounts of calcium and phosphorus absorbed. The effect was greater on the absorption of calcium than of phosphorus. Starch, glucose, fructose, and maltose added in amounts of 25 per cent did not increase the calcium or phosphorus absorption. When the amounts were increased to 50 per cent of the diet, there was a slight increase in absorption. Bergeim attributes this greater absorption of calcium to increased lactic acid fermentation in the intestines, with resulting increased acidity of the intestinal contents. Kline, Keenan, Elvehjem, and Hard observed that lactose fed to young chicks at the rate of 40 per cent had a favourable effect upon calcium assimilation and skeleton building. With lower amounts of lactose in the diet this effect was observed in proportion to the percentage of lactose present.

Maltose fed at a 40 per cent level had no effect whatever on calcium absorption or intestinal reaction.

Lactose metabolism also seems to be affected by the presence of fat. Schantz, and Hart found that, when rats were placed on a mineralized skim-milk diet, galactose was readily detected in the urine after a few days of feeding. As much as 35 per cent of the ingested sugar was recovered in the urine. Adding 3—4 per cent of butter-fat lard, corn oil, cocoanut oil, or linseed oil to mineralized skim milk prevented this loss in the urine.

In a study of the nutritive values of different sugars, Mitchell, Hamilton, and Beadles working with rats, found that sucrose, fructose, and lactose favoured the utilization of calcium more than did glucose. Lactose in addition was found to favour the utilization of phosphorus. If lactose response in the same manner in the diet of human beings, its benefits, particularly to infants and children, are of some significance.

MILK PROTEINS

The proteins in milk are of excellent biological value, containing all the essential amino acids. According to Rose the following amino acids are necessary for normal growth: lysine, trytophane, histidine, arginine, valine, leucine, isoleucin, threonine, and phenylalanine.

Of particular interest are the experiments of Rose and MacLeod which demonstrated that the proteins of milk are more efficiently utilized by the human body than are the proteins of various other foods. This fact was determined by

measuring the quantities of nitrogen taken in the food and excreted in the urine over a definite period of time. Rose and MacLeod fed young adult women a nitrogen-free basal diet to which protein was added in equivalent amounts in the form of natural foods. Over a 12-day period there was stored in a diet (a) of soybeans, 2.12 grams of nitrogen; (b) of meat, 4.33 grams; (c) of milk and bread 30.37 grams; and (d) of milk alone, 41.43 grams. Earlier experiments with human subjects, kept solely on a milk diet revealed that from 91.7 to 94.3 per cent of the nitrogen was assimilated. Working with rats, Nevens and Shaw found the digestibility of milk protein to be 91.8 per cent.

MILK MINERALS

The minerals needed for normal development are more satisfactorily supplied by milk than by any feasible combination of other natural foods. Milk is the major source of the inorganic substances in the diet of the young infant. The calcium content of cow's milk is approximately 3 times that of wheat and 6 times that of corn. Milk is considered the best source of dietary calcium. According to Sherman and Hawley children do not utilize the calcium in vegetables as efficiently as they do that of milk. They found that children up to 13 years require 1.4 grams of calcium oxide per day to secure optimum storage of calcium and recommended that each child should drink at least 1 qt of milk per day. As this early study was concerned with only 3 children, some nutritionists have questioned the validity of this general conclusion claiming that a smaller amount of milk will supply the needs of a well-nourished child.

The average calcium content of cow's milk is approximately 1.15 grams per quart. This amount is adequate for growing children, and it is on that basis that Sherman and Hawley made their recommendation. However, recent work by Kinsman, Sheldon, Jensen, Bernds, Outhouse, and Mitchell revealed that only from one fifth to one fourth of the calcium of milk utilized and retained by children. Although the utilization of calcium varies with individuals, Steggerda and Mitchell found that adults utilize approximately 20 per cent of the calcium present in milk.

Pierce, Daggs, Meservey, and Simcox found no appreciable difference in the availability of calcium in fresh and dried milk. Shields, Fairbanks, Berryman, and Mitchell also found that commercial desiccation of milk does not appreciably impair the value of the calcium in the nutrition of growing animals. They further found that the calcium in milk is definitely better utilized than the calcium in fresh carrots, lettuce, and green string beans.

Phosphorus, together with calcium, is essential for proper bones and teeth formation. Rose reports that an adult man requires approximately 1.32 grams of phosphorus per day and that the requirements for the growing child in proportion to its body weight are even more—1.0 gram per day. (Milk contains approximately 0.9 gram of phosphorus per quart).

Bethke, Kick, and Wilder report that the most favourable calcium-to-phosphorus ratio for growth and bone development in rats lies between 1 to 1 and 2 to 1. It is probable that a person who obtain the needed amount of phosphorus, without copper and cobalt as catalysts iron cannot be utilized at a sufficiently rapid rate to maintain normal hemoglobin concentration in the blood. Normal milk is deficient in all three of these minerals. For this experimental animals on a milk diet develop anemia. Other elements, such as iodine, sodium, potassium, magnesium, zinc, and

chlorine, are indispensable in nutrition. These elements are present in milk in only small amounts but, with the possible exception of iodine, are supplied in adequate amounts by the usual diet. However, a deficiency of this mineral can be easily overcome by the use of iodized salt.

VITAMINS IN MILK

Rosenberg has defined vitamins as follows:—Organic compounds which are required for the normal growth and maintenance of life of animals, including man, who, as a rule, are unable to synthesize these compounds by anabolic processes that are independent of environment other than air, and which compounds are effective in small amounts, do not furnish energy, and are not utilized as building units for the structure of the organism, but are essential for the transformation of energy and for the regulation of the metabolism of structural units.

Even though vitamins are now known to be essential for proper growth, health, and reproduction, our knowledge of their importance is of recent origin. Several of the vitamins have been identified chemically and later synthesized and are now available in pure form. A voluminous literature exists on the various aspects of vitamins, and it is beyond the scope of this chapter to review the entire work. However, a brief discussion of vitamins as related to milk will be given.

VITAMIN A. Vitamin A assists in maintaining a normal condition of the epithelial tissues of the body. There are several symptoms of a deficiency of this vitamin. Without sufficient amount the body tissue becomes keratinized or horny and in severe cases the skin and eyes are noticeably affected. Vitamin A apparently is concerned with maintaining the integrity of certain nerves, principally the optic nerve, and of the spinal column. The keratinization of the cornea of the eye results in a disease characteristic of vitamin A deficiency and known as xerophthalmia. One of the first readily detected symptoms of vitamin A deficiency is night blindness. Usually there is also a lack of resistance to infection.

From the beginning of vitamin research, milk has been recognized as a valuable source of vitamin A. in 1912 Hospkins showed that milk, when added to a diet of purified foodstuffs, produced growth in excess of what would have been expected from the amount of milk used. Later, McCollum and Davis found that butterfat contained vitamin A. In 1919 Steenbock observed a relation between the yellow plant pigment and the vitamin. In 1930 Karrer and associates isolated carotene from the yellow plant pigments and shortly thereafter proposed the structural formula for vitamin A as a derivative of carotene.

Baumann and Steenbock observed that the vitamin A content of milk varied with the season and that the carotene and vitamin A content greatly increased when the cows were turned out to pasture. These investigators studied the vitamin A content of the butterfat of milk from five different breeds of dairy cows and found an inverse relationship between the carotene content and the vitamin A potency when the cows were on the same rations. In other words, the breeds which produced highly coloured milk fat produced a milk with a relatively low vitamin A content. The carotene content of Guernsey butterfat was found to be high and its vitamin A content low, whereas the vitamin A content of Holstein butterfat was high and its carotene content low.

A distinction should be made between vitamin A content and vitamin A potency.

The carotene content of the ration is the determining factor in the vitamin A potency of the milk produced. *Although the colour of the butterfat* depends upon the carotene content, the *total vitamin A potency is determined by sum of the carotene content and the actual* vitamin A content. *It is possible to have* equal *vitamin A potencies in* Holstein and in Jersey butterfat in spite of the difference in colour.

Neither pasteurization nor storage at low temperature destroys the vitamin A in butterfat. It is, however, liable to light.

VITAMIN B-COMPLEX. After years of study a factor earlier called vitamin B has been found to consist of at least six different factors. Vitamin B1 (thiamin) is essential for growth. Without sufficient amounts of this vitamin in the diet symptoms of polyneuritis develop. In extreme cases paralysis of muscles and even death result. In human beings this disease is known as beriberi. The structure of vitamin B1 was determined in 1936. Although raw milk is a good source of vitamin B1, pasteurization has been found to destory the vitamin to a certain extent. Dutcher, Guerrant, and McKelvey found that approximately 38 per cent of this factor is destroyed by pasteurization. Krauss and co-workers arrived at a somewhat lower figure—25 per cent.

One of the vitamin B factors has been identified as nicotinic acid. This vitamin occurs in small amounts in all living cells. Liver and wheat germ are especially rich in nicotinic acid. There is evidence which suggests that this vitamin is concerned with the metabolism of both carbohydrates and proteins. It is essential for growth, and in extreme deficiencies a disease known as pallagra results. The nicotinic acid content of milk has been found to be rather low.

Riboflavin, another water-soluble vitamin of the B subgroup, also called B2 and G, was *isolated in 1933-34 by Kuhn and co-workers and in 1934 by Euler and* associates. A deficiency of riboflavin in *the diet results certain skin diseases. The serum of milk is known to be one of the* best sources of riboflavin. The *importance of milk and milk products in this respect* has not been fully appreciated. There is no food that surpasses milk as a neutral source of riboflavin. Riboflavin is stable to heat and fairly stable to oxidation but is somewhat sensitive to light.

Other members of the so-called B-complex which are present in milk are pyridoxin (vitamin B6), pantothenic acid, biotin, "folic acid", and para-amino benzoic acid. Milk does not rank as high as a carrier of these vitamins as it does of riboflavin.

VITAMIN C. A lack of vitamin C in the diet results in a disease known as scurvy. It is more common in infants than in adults. In 1932 vitamin C was identified by King and Waugh and Svirbely and Szent-Gyorgyi as "hexuronic acid". The structural formula was established in 1933 by Herbert and associates and by Karrer and associates. Even before the structure was definitely established, Reichstein, hexuronic acid. Szent—Gyorgyi and Haworth suggested the name "ascorbic acid" to connote its antiscorbutic nature.

Riddell and associates have shown that neither pasturing nor dry feeding has much influence upon the vitamin C content of milk as determined by either biological or chemical methods. Rasmussen and associates report considerable variation in the vitamin C content of milk from cows at different stages of lactation. The vitamin content was found to be relatively high during the early stages of lactation, but it decreased to a minimum after approximately 2 months of lactation and

then increased to a maximum during the later stages.

Vitamin C is subject to oxidation and is rapidly destroyed by heat in the presence of a catalyst such as copper. It is also destroyed by exposure to direct or indirect sunlight in glass bottles. Since it has reducing properities, vitamin C acid in the prevention of oxidized flavour in dairy products. As vitamin C is easily oxidized, it may be concluded that milk ordinarily is not an outstanding source of this vitamin unless special precautions are taken to exclude air, to prevent copper contaminition, and to protect the milk from both and indirect.

VITAMIN D. This is the antirachitic vitamin. It is fat-soluble and is chiefly concerned with the assimilation of calcium and phosphorus in the body. A dietary deficiency of vitamin D results in a disease known as rickets, which is manifested by improper calcification of growing bones with resultant structural weakness and body deformities.

In 1924 Steenbock and Black and Hess and Weinstock working independently, found that antirachitic activity could be induced by exposure to ultraviolet light. Windaus and associate and others have found that the precursor of vitamin D is ergosterol. At first it was thought that ergosterol was only source of vitamin D. but later it was shown that other compounds have vitamin D activity, such as 7-dehydrocholesterol. Ergosterol is found in plants whereas 7-dehydrocholesterol is of animal origin, occurring in milk and in fish oil.

The heat treatments used in processing milk and other dairy products do not diminish the potency of vitamin D. It is also stable to oxidation. Milk is not an especially good source of this vitamin, but by irradiation or the addition of vitamin D concentrates the vitamin D potency of milk can be greatly enhanced.

VITAMIN E. This vitamin, isolated as alpha-tocopherol, when deficient in the diet of rates or mice produces low fertility, poor lactation and muscular weakness. It is widespread in natural foodstuffs, including milk. The importance of this vitamin to the human being has not been determined. It is soluble in fats and insoluble in water. Although stable to heat, alkalies, and acids, it is destroyed by rancid fats.

VITAMIN K. An antihemorrhagic factor called vitamin K has been demonstrated by Dam. The presence of this factor is necessary for the coagulation of blood. Consequently, it is being used to promote blood clotting and to prevent hemorrhage in newborn infants and in operative cases. It may be assumed that this vitamin is present in milk because of the fact that laboratory animals fed exclusively on mineralized milk have shown no need for supplements of vitamin K. It is also present in egg yolk. Vitamin K is fat-soluble and is stable to light, heat, and reducing agents but is sensitive to oxidizing agents.

Manufacture of Carbides

CALCIUM CARBIDE

The manufacture of calcium carbide is one of the earliest electro-chemical industries. Its industrial development goes back to about 1892 when Thomas L. Wilson in America and Moissan in France independently developed commercial processes; indeed, they are said to have rediscovered its maufacture, for years before, Wohler, and still earlier Davy, had made calcium carbide on a small scale. The industry expanded with exceptional rapidity; in fact, in France the overproduction of calcium led to a crisis in 1899, and many of the idle carbide furnaces were converted to the manufacture of ferrosilicon and other products.

Calcium carbide is made by the interaction of lime and carbon at the high temperature of the electric arc:

$$CaO + 3C = CaC_2 + CO - 110{,}000 \text{ Calories}$$

The action is reversible and according to the phase rule has one degree of freedom; that is, at a given temperature there is one definite pressure of carbon monoxide which corresponds to equilibrium. At 1,475 deg. C. (2,677 deg. F.) the equilibrium carbon monoxide pressure is 0. 80 mm. mercury. Above 1,500 deg. C. (2,732 deg. F.) calcium carbide decomposes into its elements but not so rapidly as it is formed or its manufacture would not be possible.

Commercial calcium carbide is dark coloured, but in the pure state it is colourless and transparent. When calcium carbide is treated with water, acetylene is formed.

$$CaC_2 + 2H_2O = Ca(OH)_2 + CH$$

The acetylene is used for illumination, for cutting and welding by oxyacetylene torches, and as a starting point for the synthesis of organic compounds such as acetic acid, acetone, and methanol. Calcium carbide is also used for the fixation of atmospheric nitrogen as cyanamide according to the equation.

$$CaC_2 + N_2 = CaCN_2 + C$$

It is strong reducing agent and is formed in the arcing zone of electric-arc steel furnaces when lime and a carbonaceous material are added to the charge. The fact that arc furnaces will form calcium carbide is claimed to be one of their points of superiority in steel refining. Calcium carbide is insoluble in all known solvents.

RAW MATERIAL.—The materials used in the manufacture of calcium carbide are carbon, in the form of coke, coal, or charcoal, and lime, and to which may be added carbon from the electrodes.

As a source of carbon, anthracite coal has found wide application in England, but in the United States petroleum coke and to a much large extent ordinary coke are used almost exclusively. Ash, phosphorus, sulphur, and moisture should be as low as possible. Coke with ash above 12 per cent is not desirable and that under 8 per cent is preferable. Charcoal as a source for carbon has the following advantages: it causes smoother furnace operation and enables a higher output to be reached than with coal or coke, and the carbide obtained is of the best quality in respect to gas-yield and absence of impurities. However, charcoal is little used, for because of its low fixed carbon content (about 56 per cent) and its friability only about half the charcoal paid for enters into the furnace charge in a usable condition, which on account of its high price makes its use costly. Furthermore, the carbide produced from charcoal is not suitable for use in many modern acetylene generators.

If the carbide is to be used for acetylene production, phosphorus in the carbonaceous material is the most obnoxious impurity, for under the strongly reducing conditions in the furnace the phosphorus will appear in the carbide as a phosphide, which when treated with water in the generator forms poisonous phosphine, PH_3. When acetylene is generated from a phosphorus-containing carbide it produces a haze of phosphoric acid around the burner when burned. Sulphur is not as objectionable as phosphorus, but if it exceeds a maximum limit it will cause difficulties with the acetylene burners.

The lime used is perferably a good quality of chemical lime made from a limestone containing at least 97 per cent calcium carbonate. As much as 1 per cent of magnesium oxide may be present with the production of a good grade of carbide, but it reduces the fluidity of the carbide and thereby may cause difficulty in tapping furnaces. It is preferable, therefore, that limestone with a magnesium oxide content of 0. 5 per cent or less be used. Alumina also decreases the fluidity of the carbide but it is not so bothersome as magnesium oxide. Silica in the lime lowers the fusion temperature and thereby it increases production and facilitates the operation of tapping furnaces, but the percentage of calcium carbide in the furnace product is decreased. Limestone with silica content under 1.25 per cent of carbide manufacture is to be preferred.

Ingot Furnaces, Batch Type.—In the early history of calcium carbide manufacture, the carbide was produced in ingot furnaces. It is now made in tapping furnaces, but a brief description of these earlier furnaces will be given.

In one type of ingot furnace a box of iron plate, lined with carbon, was mounted on wheels so that it could be moved easily in the housing above the box. Electrical connections were made to the carbon lining and to the electrode. The furnace had a funnelshaped extension at the top lined with refractory. The charge was shovelled into this and heaped around the electrode. During a run it was necessary to raise the electrode from time to time as the carbide is collected in the crucible. When the run was completed the hearth conductor was disconnected and the furnace was wheeled away and allowed to cool. The charge was then removed and the carbide centre was freed from large quantities of adhering carbon and lime.

The furnaces were of the smothered-arc type and were built in units of about 250 kw. requiring on an average about 55 volts. The ingots weighed nearly 900 lb. but contained only about 50 per cent good carbide. The yield, therefore, was low, a ton of 85 per cent commercial carbide requiring a little over a ton each of carbon and of lime and over 100 lb. electrode carbon. The energy consumption was about 3 kw-hr. per lb. of 85 per cent carbide.

Horry Continuous Ingot Furnace.—The Horry carbide furnace consisted of a slowly rotating drum-shaped furnace about 8 ft. in diameter and 3 ft. long. The ends of the drum consisted of two vertical discs held apart by a horizontal cylinder concentric with the axis of the furnace. Segments of cast-iron plates were bolted to the outer circumferences of the side discs, but only on the lower half, so that an annular space was formed. A vertical charging shaft was placed tangentially over one end of this segment, and two electrodes were suspended in the lower part of this shaft. The charge was fed down the shaft around the electrodes. The current entered through one electrode and passed through a small portion of the charge and then out the other electrode.

The electrodes were completely imbedded in the charge and were well protected from oxidizing influences. The furnace revolved slowly so that the carbide formed under the electrodes moved downward. A revolution was made in about 2 days. Opposite from the charging side the cast-iron plates were unbolted and removed and the carbide was removed. The plates were taken to the charging side and bolted in place for another half-revolution.

The feeding of the charge, regulation of the electrodes, and rotation of the furnace were taken care of automatically.

The furnace was of the smothered-arc type and took a current of 4,000 amp. at 75 to 80 volts and had a daily production of 2 tons, which corresponded to an energy consumption of approximately 1.63 kw-hr. per lb. of carbide. The electrode consumption was about 4½ to 6½ lb. per ton of product.

TAPPING FURNACES.—Practically all the ingot carbide furnaces have been superseded by tapping furnaces. The furnaces themselves are usually of simple construction, but the automatic electrode regulators and charging devices and other accessory equipment may make a large unit quite complicated. The carbide furnaces are rectangular in shape, 12 ft. by 22 ft. by 6 ft. deep. They are large steel boxes lined with firebricks. Tapping furnaces are built in open and in closed top design; in the latter type the dust and gases can be collected and used. Recovered carbon monoxide is used for burning limestone to lime.

In three-phase furnaces, the electrodes are suspended vertically in lime or located at the points of a triangle. Electrical connection of the electrodes is three-phase delta or less commonly star connection with the hearth connected to the central point of the transformer. Heating is largely by resistance through the charge, but there is also some arcing between particles. Currents of 25,000 to 240,000 amp. per electrode or electrode bundle are being used. The operating voltage is from 110 to 125 volts.

Modern furnaces are charged in a continuous or intermittent manner by mechanical means. The molten carbide is tapped through one or more tap holes in the front of the furnace. American practice tends toward a single tap hole per furnace; European practice is to have a separate tap hole in front of each electrode. The molten carbide runs into cast-iron chills or bowl-like moulds. When cool it is broken up, screened, and packed in air-tight containers unless it is to be consumed immediately at the plant.

The Miguet furnace has found considerable favour in Europe. The furnace proper is supported on pillars with the transformers located beneath the furnace. Forced air cools the transformers and the under part of the furnace. A single large electrode carries the high current, which may be as high as 240,000 amp. The electrode is built up of prebaked carbon segments dovetailed and bolted together. The current is led to the electrode by means of a number of separate circuits arranged around the furnace.

For the production of 1,000 lb. of 85 per cent carbide there are required in the aggregate 980 lb. of lime, 650 lb. of coke, and 20 lb. of electrode. The average composition of commercial carbide from a large furnace was: calcium carbide 85.5, calcium oxide 8.2, carbon 2.1, magnesium oxide 0.5, silica 3.2, sulphur 0.3, and alumina plus iron oxide 0.2 per cent.

Furnaces are built in sizes up to 25,000 kv-a. and over, producing about 17.5 to 2 lb. calcium carbide per kw-day.

SILICON CARBIDE

Silicon carbide, SiC, is better known by its trade names "Carborumdum", "Crystolon", and "Carbolon". It is produced along with other compounds when silica is reduced by carbon at high temperatures. The reaction as regards raw materials and end products may be represented by the equation:

$$SiO_2 + 3C = SiC + 2\,CO$$

Silicon carbide was discovered accidentally in 1891 by Acheson when he attempted to form diamonds by dissolving carbon in molten clay. Instead of diamonds he obtained blue crystals of silicon carbide, which he believed to be made up of carbon and corundum (alumina), and he therefore named the new product carborundum. Its value as an abrasive was soon evident, and later it was found to be a valuable refractory material also.

Silicon carbide is made commercially in large quantities by heating a suitable mixture of carbon and silica in a resistance furnace. At the temperature of the furnace a number of reversible reactions may take place as shown by the following equations, although not all the reactions have been definitely established.

$$SiO_2 + C_2 = SiO + CO$$
$$SiO + 2C = SiC + CO$$
$$SiO + C = Si + CO$$
$$Si + C = SiC$$

RAW MATERIALS. — The chief raw materials for silicon carbide manufacture are silica and carbon. Little difficulty seems to be experienced in obtaining a good grade of silica sand containing above 98 per cent SiO_2. The carbon is supplied by a good grade of anthracite coal, coke, or petroleum coke. The anthracite and coke should be low in sulphur and ash. Sulphur produces unpleasant sulphur dioxide fumes during operation, and iron oxides and alumina are apt to interfere seriously with the uniformity of ceramically bonded products made from the grain. The sand and carbon are mixed in the proportion corresponding roughly to the molecular rations given in the first equation.

Sawdust is generally mixed with the the charge; it increases the porosity of the charge at furnace temperatures, making it easier for the carbon monoxide and other volatile products to escape. Salt is used to convert the metallic oxides, especially iron, to volatile chlorides. A typical charge based on figures given by Tone consists of sand 54.4, coke 35.1, sawdust 7, and salt 3.5 per cent.

FURNACES.—The general arrangement of a silicon carbide furnace is given here. At the Carborundum Company, the furnace consists of a U-shaped trough of firebrick, 6 ft. across, 6 ft. deep, and 40 ft. long. The brick trough is supported on piers in such a way that the furnace bottom is air cooled. At each end of the trough is a reinforced brick pier through which the water-cooled graphite electrodes pass. In charging the furnace the raw materials are loaded into the trough until level of the electrodes is reached. A core of granular graphite serving as the current carrier or resistor is then run through from one electrode to another. The remainder of the charge is heaped over the graphite core, and when completed consists of about, 70,000 lb. of material in the form a cylinder.

There is no noticeable change after the current is turned on except that the charge gradually sinks in volume, and and flames of carbon monoxide appear flickering over the surface of the charge and between the loosely set firebrick of the walls and bottom.

The mass after completion of a run is composed of several concentric cylinders or strata. On top is a loose crust of siliceous material and unconverted charge. This is returned to the mixing room, or

it badly caked with volatile impurities from the hot zone is discarded. Next comes a layer of partly converted mix and poorly crystallized silicon carbide. This is known as "firesand" and is utilized in refractory cements for lining and other furnaces. Inside of this and gradually merging into it is the high-grade silicon carbide of abrasive and refractory quality. After being allowed to cool the mass of intercrystallized silicon carbide is broken up with bars into smaller pieces and are transported to the curshers.

Pure silicon carbide is colourless, but the furnace product is green, blue, or black, and iridescent. The iridescence is seen by reflected light and is due to a thin film of silica which can be removed by treatment with hydrofluoric acid. The green or blue colour is seen by reflected light.

A 1,500-to 2,000-kw. furnace producing 10,000 to 16,000 lb. in a run of 36 hr. requires an initial voltage of 250 to 300 volts. As the conducting core heats up, its resistance drops and the voltage must be reduced to prevent the current from becoming excessive. At the end of a run the voltage is about 200 volts. The current at the start of a run is about 6,000 amp. and increase gradually to 20,000 amp. The average power required is about 3.5 kw-hr. per lb. of silicon carbide The theoretical yield is estimated to be 1.76 kw-hr. per lb.

The temperature of silicon carbide formation (at which the vapour pressure of carbon monoxide is 1 atmosphere) is dissociation temperature (at which the vapour pressure of silicon equals 1 atmosphere) is above 2,500 deg. C. (4,532 deg. F.). The ideal operating condition would be such that all parts of the charge are heated to a temperature between these two limits.

The formation of silicon carbide from the raw materials is an endothermi reaction. The building up of a larg crystalline ingot of carbide in a resistanc furnace is a time-temperature functior The formation of large crystals can b brought about at high temperatures in relatively short time or at lower tempera tures in a longer time. The formation o a large crystalline ingot of silicon carbid involves the vaporization of crystals i the inner temperature zone, and th recrystallization of the mass by growth o the large crystals at the expense of th small ones. The vapour of silicon carbide or its dissociation products supplies material for the growth of larges crystals.

Firesand includes considerable amounts of amorphous or poorly crystallized material and is formed as a by-product in the furnace zone outside the crystalline silicon carbide. It is not as refractory as the crystalline carbide and oxidizes more easily. It is suitable for use for furnace bottoms and for crucibles where the furnace atmosphere is of a reducing nature.

PROCESSING OF THE SILICON CARBIDE.—The carbide is ground in dry pans about 7 ft. in diameter. The two mullers weigh about a ton each and are equipped with chilled iron or manganese steel tires to resist abrasion, but the wear on the grinding equipment is very severe.

The crushed material is put through an acid (H_2SO_4) wash in lead-lined tanks and may be treated further with a hot caustic solution. The chemical treatment removes silicon, iron, silicides of iron, aluminium, and graphite.

Iron is reintroduced by abrasion of containers and in subsequent grinding operations and is removed by means of a magnetic pulley or a high-intensity magnetic separator.

Some of the silicon carbide is merchandised as dry powder or grains, but the

greater part is manufactured into grinding wheels, abrasive stones, coated cloth and paper, refractories, and electrical resistors.

For grinding wheels several different bonding agents are introduced, depending upon the pnurpose for which the wheels are to be used. A vitrified binder of the general nature of porcelain is a common agent. The abrasive grain, clay, and other bond, if needed, are mixed with water. In the wet or puddling process the mixture is stirred for several hours in a hemispherical tub for the purpose of securing a thorough mixture and of removing any entrapped air. The mixture is then poured into metal ring moulds supported on plaster "batts" and lined with heavy paper. The batts remove most of the water by absorption before the wheels are put in drying oven. In the dry-process the ingredients with much less water are introduced in tumbling barrels and turned until the abrasive grains are coated with bonding material. The mixture has the general consistency of moulding sand. The mixture is transferred to steel moulds and subjected to hydraulic pressure. When dry, the wheels made by either process are fired in a kiln to become vitrified. In another method, sodium silicate (water glass) is mixed with the sized silicon carbide grain. The "green" shaped wheel is dried and then baked at about 260 deg. C. (500deg. F.), which hardens it into a firm unit. For thin wheels rubber is mixed with the grains, and the mass is rolled into sheets of the desired thickness. The wheels are stamped from this and are then vulcanized. Shellac and synthetic resins such as Redmanol are similarly used for making thin cutting wheels.

Grains of silicon carbide are also fixed with glue to the surfaces of paper and cloth used for grinding and polishing purposes.

For refractory manufacture the silicon carbide grains are carefully screened and different sizes are mixed in proportions calculated to give a dense product. The silicon carbide is mixed with about 8 per cent plastic refractory clay as a bonding agents and the refractory shapes are formed from the damp mass. The dried shapes are fired in kilns to cone 14 (approximately 1,390 deg. C. or 2,534 deg. F.)

Recrystallized Silicon Carbide.—For exceptionally severe duty, refractories are prepared by the Carborundum Company without any clay or other permanent bond. A temporary bond of tar or pitch holds the bricks in shape until they have developed sufficient strength by recrystallization. The "green" brick are placed in the regular silicon carbide furnace in the mix surrounding the granular graphite core. As the temperature rises,the tarry bond distills off; and at the higher temperatures some of the silicon carbide grains volatilize and recondense or recrystallise in an interlocking manner, giving the brick exceptional strength when put in service at high temperatures. Recrystallized silicon carbide bricks are sold under the trade name of "Refrax".

Silicon carbide refractories are exceptionally refractory and possess the valuable property of maintaining high mechanical strength at furnace temperatures. Tests have shown that at 1,300 deg. C. (2,372 deg. F.) the cross-breaking strength is practically the same as at atmospheric temperatures. The heat conductivity of the refractories is also high.

Silicon carbide is also used for the manufacture of electrical heating resistors, such as "Globar", but manufacturing details have not been disclosed.

BORON CARBIDE

The raw materials are boric acid and a high-purity coke. The boric acid is

first dehydrated by heating it to fusion, which is carried on outside the final furnacing operation. The anhydrous gas and the coke are then placed in a special resistance furnace, in much the same way that sand and coke are heated in a silicon carbide furnace. A central heating core is provided, and the surrounding mixture is heated to 2,500 to 2,600 deg. C. (4,532 to 4,721 deg. F.). A cylindrical ingot of boron-impregnated crust encloses a zone which consists largely of freely developed crystals of boron carbide. Inside this zone is a zone of molten carbide which fuses and forms a thick ingot. The separated product is sorted and classified for various uses. A typical furnace product contains 97 per cent boron carbide, 2 per cent boron, and small amounts of other materials.

Boron carbide is exceptionally hard, having a hardness greater than silicon carbide but less than diamond. This hardness has led to the substitution of boron carbide lapping power for diamond dust in various commercial operations. Boron carbide is inert to all solutions of acids and alkalies in all concentrations. The oxidizing acid mixtures are without effect. The density of boron carbide is approximately 2.52.

Boron carbide is comparatively new as a commercial item, and it is probable that a number of new applications will be found. The industrial applications of boron carbide depend upon its hardness its ability to be melted to a liquid phase and then cast to desired shape, and its freedom from pores. It is being used as an abrasive and polishing power. In cast form it is especially suited for use as pressure blast nozzles. There is also promise of application of the moulded product to jewel-type bearings.

Preparation of Cakes

In the manufacture of cakes besides eggs, butter and sugar, a much greater variety of material is used. The richer the ingredients are added the more palatable the product will be. The dough is worked carefully; moulded into cakes of fancy shape and size; put into tin forms lined inside with buttered paper and baked over a slow fire.

DECORATING CAKES

The decoration of cake mainly depends on the artistic skill of the baker. Designs of scroll work and lace work and intricating modelling in bas-relief are formed from mould of sulphur or plaster of Paris. The baker forms gum paste by beating finely ground sugar with a quantity of gum tragacanth solution, till he gets it to a consistency fit for working. The mould having been rusted with dry sugar powder the plastic mass is pressed into the hollow design. The superfluous mass is next cut off with a blunt knife and the moulded articles are taken out.

These ornaments are then bent so to fit the curvature of the side of the cake and left to dry in that particular form which is required.

In general, great care must be taken to the baking process. So that the articles may neither underbaked nor be overbaked.

RECIPES

ORDINARY

I

Flour	1 lb.
Sugar	1 "
Almonds	½ "
Eggs	7
Lime juice	1
Rose water	q. s.

The sugar should be powdered and sifted; the skimmed almonds are brayed in rose water. Beat the white portion and the yellow portion of the eggs separately for half an hour. Mix all the ingredinets except flour and pound together for half an hour. Then add flour and knead thoroughly. Mould the dough into cakes of desired shape and size put into paper mould and bake carefully in an oven.

II

Flour	2	lbs.
Sugar	1	lb.
Butter	1	,,
Nutmeg	1	oz.
Mace	½	,,
Currants	2½	lbs.
Mace	½	,,
Almonds	½	lb.
Orange marmalade	½	,,
Brandy	10	oz.
Orange flower water	3	spoonfuls.
Egg	16	

Beat the butter into cream; mix the sugar. Add to this mixture the white of the eggs beaten to a froth. Also add the yolk similarly beaten. Powder the spices, mince the raisins and grind the almonds. Now mix together all the ingredients and knead into a dough. Make cakes of desired size and shape from this mass. Put them in buttered tin mould lined with oiled paper. Bake in a very slow oven for a couple of hours, otherwise all the ingredients will not be cooked. Be careful not to even them.

ROCK CAKES

Stir to a cream ¼ lb. of fresh butter and tablespoonful of Vanaspati 3 ozs. of castor sugar, a little baking power, 2 ozs. of sultanas, currants or stoned raisins add ½ lb. flour and mix well. Stir into the mixture a beaten egg and about two tablespoonfuls of milk. The mixture should be very stiff and the oven quick, but not fierce. Drop small pieces on a sheet of waxed paper well apart from one another and bake for twenty minutes. Do not attempt to smooth the top of the cakes as they are best left uneven and in appearance like a small piece of rock.

SCOTCH SCONES

Two ozs. of butter rubbed into ½ lb. of flour, a pinch of salt, and a little baking powder. Beat well 1 egg with 2 tablespoonfuls of milk and make into a stiff paste. Turn on a pastryboard and roll to the thickness of half an inch. Cut into threecorner pieces or round, and bake in a moderate oven twenty minutes. Split, and butter the insides.

Note.—These scones can be easily glazed by lightly brushing over the top with a pastry-brush and a little beaten egg before placing in the oven.

COCONUT CAKE

Reduce to a cream a ¼ lb. of butter and mix in ½ lb. sugar; rub into this ½ lb. flour, a teaspoonful of cream of tartar, ½ a teaspoonful of bicarbonate of soda, and 2 ozs. of desiccated coconut. Mix well with the beaten whites of 6 eggs and ½ a teacupful of sour milk. Make into small cones and roll each in a little more coconut. Cook in a very moderate oven fifteen to twenty minutes, according to the size of the cakes.

FAIRY GINGERBREAD

Cream 2 ozs. of fresh butter and rub into it 2 cupfuls of flour, a pinch of baking powder, a cupful of fine sugar, a small teaspoonful of ground ginger; mix stiff with ½ a cup or a little more milk. Butter the bottom well of a flat baking-tin, place a layer at a time of the mixture on it, and cook on the top of the stove, afterwards place a few moments in a quick oven.

GOLDEN CAKE

Cream 2 ozs. of butter and a large

cupful of flour, a cup of white sugar, a little baking powder, and a little vanilla flavouring. Mix with a cupful of milk and the beaten yolks of 6 eggs. Stir well and bake in a tube pan.

Note.—In all recipes where the yolks only of eggs are used, it is well to have on hand some other dish where the whites are necessary. These however will keep perfectly fresh for days if all air is excluded from them.

ORANGE CAKE

Cream 2 ozs. of butter with ¼ lb. of white sugar, add a little power and 3 teacupfuls of flour. Beat these ingredients well with the yolks of 4 eggs and a cup of milk. Continue beating while adding the juice of 2 and the grated rind of 1 orange. Whip, the whites to a stiff froth and beat into the mixture. Bake in well-buttered tins in layers. Pile each on the top of the other and dust over all some fine white sugar.

SAND CAKE

Cream 6 ozs. of butter and add 6 ozs. of castor sugar and 5 ozs. of potato flour, add 6 well-beaten yolks of eggs, a little grated lemon, and a pinch of salt. Pour the mixture into a well-buttered mould dusted well with a little potato flour. Bake in a gentle oven forty-five minutes. This cake is best iced with an icing flavoured with a liquor.

BERTHA CAKE

Pound ¼ lb. of Barcelona nuts to a pulp with ½ a teacupful of water, add 5 ozs. of sugar, 1 oz. of butter, 6 well-beaten yolks of eggs and the lemon rind grated. Mix all well together and add 1½ ozs. of flour. All this must be beaten perfectly smooth; add a little orange juice and the beaten whites of the eggs. Line a baking-tin with a light puff-baste, spread over a thin layer of raspberry jam, then pour in the mixture, smooth it over the top with a clean knife-blade and bake in the oven for fortyfive minutes. This cake can also be served iced if preferred.

CORSICAN ESTER CAKE

This cake is made like bead with the addition of 2 ozs. of fresh butter mixed in it and milk used instead of water. This is then formed into a large lifebuoy-shaped loaf with a clear ring in the centre. Then insert at intervals of two inches a hardboiled egg. The object being that the cake when cut provides an egg with each portion. The ring is sufficiently thick to conceal the egg. Great care is always exercised in cutting the first slice in order that the egg should not be cut through.

COFFEE CREAM

Make a stiff paste of ¼ lb. of pounded almonds, ¼ lb. sifted sugar, 2 tablespoonfuls of orange-flour water, 2 desert-spoonfuls of cold water. Take ½ lb. of puff-paste, divide it in two, one part a little bigger than the other. Roll the smaller piece to the thickness of an eighth of an inch, lay this in the bottom of a buttered round baking-tin, spread on to it the almond paste to within half an inch of the border, moisten the edge, roll the remainder of the pastry to twice the thickness of the lower piece. Join it by pressing the two edges of the pastry together with the fingers, and brush over the top with the yolk of an egg. Bake in a good oven thirty minutes. Dust lightly a little sugar over all an instant before removing form the oven.

SAVOY CAKE

Put into a deep basin ¼ lb. powdered white sugar, the yolks of 7 eggs, the grated rind of 1 orange and 1 lemon, and a pinch of salt. Work well together till creamy, beat into this 2½ ozs. of flour and 1½ ozs. of potato flour; continue to beat steadily. Whip the whites and add to

the mixture. Butter thickly a mould, carefully draining any that may be over from the mould, dust it over with a little potato' flour and sifted sugar. Fill the mould three quarters full, taking care to put the mixture in by spoonfuls and always in the centre of the mould. Place the mould or cake-tin in a good oven for an hour. Wait two moments when removed from the oven, turn on to some sugared paper, then on to a warmed plate, and dust with castor sugar. The cake should be covered with a buttered paper before being put into the oven. Also, if the mould is small, pin a piece of buttered paper to reach above the top of the tin for fear the cake should overrun while being cooked.

MOKA CAKE

Mix ¼ lb. of sugar with 3 ozs. of flour, and half that quantity of potato flour, 5 yolks of eggs, the rind of 1 lemon, and the whites beaten to a stiff froth. Put into a buttered mould and bake in a gentle oven for forty minutes. Remove from the oven and allow to get cold. Cut it through the middle lengthwise, twice if desired, and spread the coffee cream on the lower half, cover with the rest of the cake and dust over the top a little fine sugar.

COFEE CREAM

Put into a deep basin the yolks of 3 eggs, ½ a teaspoonful of potato flour, and 3 tablespoonfuls of powdered sugar, thin with ½ a cupful of strong black coffee. Stir over a slow fire until the cream thickens; it must boil and must not be lumpy; add to it in small pieces at a time ¼ lb. of fresh butter half dissolved; beat all briskly with the whisk until the commences to thickness; at this point it can be spread on the cake.

RUSSIAN CAKE

Six ounces of sugar, 6 of flour, 4 of butter, and 3 of almonds—not peeled but chopped, 2½ ozs. of candied peel and the beaten whites of 6 eggs. Beat the butter until creamy, add by degrees the sugar and the whites of the eggs, than the chopped peel, the almonds, add the flour last of all. Butter a large baking-tin and put some of the mixture in round cakes on the tin; repeat till the tin is full. Bake in a moderate oven.

RUSSIAN CHERRY CAKES

Stir to a cream 3 ozs. of fresh butter with a teacupful of fine white sugar, 2 eggs well-beaten together, and added to the butter ½ a teaspoonful of vanilla, a pinch of salt, and mix in 2 cupfuls of fine white flour; a little milk may be used if too stiff. Cover and leave overnight to become firm. Then roll thin on a floured board, cut into small rounds, dip each into beaten egg, then in the following mixture of a few finely chopped almounds, ½ a teacupful of sugar and a very little ground cinnamon. Have these things well mixed together before dipping the cakes into it; place a preserved cherry in the centre of each and bake ten to fifteen minutes in a good steady oven. The cakes to be laid well apart on a sheet of buttered grease-proof paper.

SWEDISH BUNS

Beat 2 ozs. of butter with 1 teacupful of fiine white sugar well together, add the grated rind of 1 orange, a tablespoonful of the orange juice, strained, and the beaten yolks of 3 eggs, then work in enough flour to make a very stiff dough. Cover and leave overnight on the pastry-board-not in a bowl. Roll thin and cut into shapes of rounds; brush each with the beaten yolk of an egg, and decorate with some angelica, candied fruits, or flowers, pressing these ingredients lighty into the dough. Bake in a steady oven fifteen minutes. These cakes will keep a long time if allowed to get quite cold before in an air-tight-tin.

CORNISH DOUGH CAKE

One fourth of a new quarter of bread dough when it has been made and raised for bread. Put this into a floured pastry-bowl, and proceed as follows. Work into it with the hands 2 ozs. of butter, 4 tablespoonfuls of demerara sugar, ¼ lb. of stoned raisins or sultanas, little citron or spice and a beaten egg. Knead steadily, then cover and leave the cake to rise for an hour before putting it into a buttered tin and baking for one and a half hours.

Note.—A little pinch of saffron water may be used instead of or with the fruit if desired. This cake is seldom iced and is best kept uncut for at least two days.

POLISH SOUR CREAM CAKE

A great deal of sour cream is used in Poland, and the following cake is a very ordinary one; it is little trouble to make and quite inexpensive. Beat thoroughly with a dinner-fork in a large basin one egg and then add one teacupful of sugar; mix well together, add a pinch of salt, a little lemon juice, half a teaspoonful of baking powder, and then the sour cream. Mix well, then work in about two teacupfuls of fine white flour. When all is thoroughly mixed into a stiff dough, place in a well-buttered baking-tin and cook in a steady oven for one hour. This cake is much improved if covered with a simple white icing.

Note.—The use of a teacup for measuring the quantities is recommended as when collecting these recipes I often found anything in the form of scales impossible to obtain.

A SIMPLE POUND CAKE

Beat together to a cream 1 lb. of butter with 1 lb. of sugar until quite creamy, then work in ½ lb. of fine white flour a teaspoonful of flavouring essence, a teaspoonful of almond extract, a pinch of salt, and 7 eggs well beaten. Beat hard and add gradually the remaining ¾ lb. of flour. When this is well mixed line a buttered tin, or rather two buttered tins, with oiled paper, put in the cake, and bake in a good gentle oven two hours.

Note.—This recipe is for a very large family cake, but it is easy to reduce the ingredients by half, using four eggs to the half quantity of cake.

CARAWAY SEED CAKE

Stir to a cream 2½ ozs. of butter with the same quantity of sugar; gradually add 3 well-beaten eggs, a little baking powder, a pinch of salt, 2 teaspoonfuls of caraway seeds, a little finely chopped citron, ½ a teacup of milk, and lastly a breakfast-cupful of white flour. Beat the mixture for fifteen minutes, then butter the cake-tin, warming it to induce the butter to run well over it, line with butter paper and put in the cake. Bake in a good moderate oven forty-five minutes or more according to the oven, as it may require an hour. Dust over the top with a little sugar and lay one or two thin slices of citron across before placing the cake in the oven.

PRINCE OF WALE'S CAKE

Stir one way in a deep bowl 2½ ozs. of fresh butter—not salt—and when reduced to cream a cupful of demerara sugar, add 2 eggs well-beaten and 4 tablespoonfuls of thick honey, and mix into this a cupful of sour milk. Then add a teaspoonful of ground cinnamon, a little baking powder, a pinch of salt, and 1½ cupfuls of fine white flour. A little more may be added if the mixture is not quite stiff enough. Work in with the hand a cupful of finally chopped raisins, turn into a deep buttered cake-tin and a half hours, after taking the precaution to cover the top of the cake with a piece of buttered paper to prevent the cake from taking colour too soon.

ANGEL CAKE

Beat in a plate with the blade of a freshly cleaned dinner-knife the whites of 4 eggs until they will stand up stiff, add ½ teaspoonful of vanilla, and the same quantity of almond essence, ½ a cupful of white sugar, ½ a teaspoonful of cream of tartar, and a little salt. Beat this well together, 1 tablespoonful of cornflour mixed previously with ½ a teaspoonful of fine white flour. Beat all together a moment and turn into a large unbuttered angel cake-pan. Cover with a slightly buttered sheet of grease-proof paper for last fifteen minutes of cooking. The cake will take three-quarters of an hour to cook. The best form of cake-tin this cake is one with removable sides as the cake is very easily broken and rendered unsightly.

SCOTCH SHORTBREAD

Mix together thoroughly 1½ cupfuls of fine white flour with ½ a teacupful of corn-flour, a good pinch of salt, and then rub in with the hands ¼ lb. of fresh butter and ½ a cupful of sugar. Knead together well till the dough is fine and smooth. Roll on a pastry-board to the thickness required—about three-quarters of an inch—cut into cakes, with a fancy cutter, lift with the blade of knife on to a buttered sheet of paper and bake in a slow oven three-quarters of an hour.

CUP MOULD CAKES

These inexpensive little cakes which are easily made and quickly cooked will recommend themselves very highly to the busy housewife or cook-general. Beat 1½ ozs. of butter to a cream and add a cupful of fine white sugar, a little salt, a little flavouring such as essence of almonds, a teaspoonful of baking powder, the beaten yolks of 2 eggs, and stir in a large cupful of flour and ½ a cupful of milk, lastly the whites of the eggs beaten to a stiff froth. When all is mixed well together add either some split stoned raisins or sultanas, or currants. Put the mixture into some well-buttered cake-cups and cook in a hot oven fifteen or twenty minutes. These cakes can be served in the cups in which they are cooked.

POSITION OF THE GARDEN

In the situation of the garden it is of great importance to have protection from the prevailing winds. If natural shelter is not available the first attention must be given to providing a screen of some kind. For this purpose such trees as are found to grow luxuriously in the neighbourhood may be planted, or if the garden be small and immediate effect desirable, coir or wire matting may be stretched between poles set up at intervals. On the sheltered side of the matting a hardy climber may be planted to improve the appearance of the screen; but the protecting screen must not be too dense or near. What is wanted is that the air currents may be broken rather than stopped, because a garden where a close still atmosphere prevails, will have much fewer flowers than one open to the breeze, which cools the air and causes the dew to fall. The close moist atmosphere is adapted for many kinds of foliage plants and an open airy position for flowering plants.

Regarding aspect a point between east and north is desirable. The east wind is often severe on garden plants but the amount of its mischief will be found less than the intensified sun's rays on the other exposures produced. Moreover, when plants are moist with dew or fresh from cool night the rays of the rising sun appear to have an invigorating effect that is decidedly wanting when the plants have been subject to heat sufficient to evaporate the greater part of the moisture gathered during the night before they are struck by the powerful rays of the mid-day sun.

ENEMIES OF THE MANGO

The mango tree struggles throughout life against numerous depredators; when only a few weeks old the pith at the base of the stem has a special attraction for rats and many young trees are destroyed for a few bites, and it may be necessary to enclose the seedling with wire-netting or lay down mixed with arsenic. Fortunately the season during which the young trees attract rodents is a short one. Leaf eating caterpillars may be trapped by spreading a mat freshly coated with tar on the ground and shaking the branches, but a more serious enemy is the caterpillar that infests the pith of young branches; there is nothing for it but cut off the branch and throw it into a pond where fish may benefit. The large grubs that bore a passage into the wood of the nature branches may be caused to emerge by squirting in kerosin. The grub may be thrown to the crows and the aperture closed with a cork or with clay.

When aphides have been sucking the juice of the tree and have covered the leaves with their viscid exudation, known as honey dew, a black fungus thrives on the excretion, and gives the trees a very disagreeable appearance, but as it occupies only the upper surface of the leaf, and is living on the honey dew, the fungus is not doing serious injury, and a few days of heavy rain will wash it off. Surface fungi of this kind may be killed by spraying with 3 per cent. solution of sulphate of iron, hirakas, but the dead fungus must be washed off, if the appearance of the trees is of importance.

CULTURAL ESSENTIALS

A market gardener who wishes to succeed in his business must be in all respects a skilful cultivator and should have gained his practical experience by working through all departments. We summarise here the essentials that must not be ignor-

ed, and upon the due observance of which most of our instructions and suggestions depend for their efficient application.

1. Clealiness. It does not pay to grow weeds. The destruction of all, but especially those with creeping roots or, abundant, easily dispersed seed, must be followed up vigorously.

2. Persistent Cultivation i.e. the stirring, breaking and deepening of soils, whenever the weather conditions permit such operations with safety. The deepening to be preferably effected by the gradual improvement of lower layers, and mixing with the upper portions not by bringing up large quantities at once. When the sub-soil is harsh or unfavourable bringing it to the surface results in a total deterioration of the whole depth.

3. Maintaining the Fertility. Constantly adding artificial and organic manure in proportion to the character of the soil and the crops removed, so that the essential elements may always be present in abundance, the physical condition being improved as regards aeration, warmth, and the chemical actions in the oil assisted by sufficient quantities of humus, i.e. decaying vegetable matter chiefly.

4. Protecting Crops from Insects and Disease. Prompt adoption of measures for the destruction of insects, and the use of remedies for, or preventives against diseases.

AGRICULTURAL OPERATIONS FOR AUGUST

FOR THE PLAINS

Vegetables: Sowings of Gelery shoull now be made in pots, under shelter from the rains. The seed will be slow in germinating; but it is important that plants should be brought as forward as possible for planting out when the rains are over in October.

At this time also Asparagus seed should be sown, for a supply of plants to make new beds within October if needed.

Sow the small kind of Tomato.

Fruits: It will be found that Peaches, Plums, and Orange and Lemon tribe may now be budded successfully in Lower Bengal.

Cuttings also or the Orange tribe, now laid down, will strike readily.

The fruits of Guavas, Custard-apples, and Pomegranates should be tied up in fine muslin, to protect them from the attacks of birds and vermin.

Now is the season for planting out suckers or offsets of Pineapples.

Ornamental Plants: Roses may be budded during this month also in Lower Bengal. Stephanoties floribunda and many of the choicest tropical plants may now be propagated by cutting in sand under glass.

FOR THE HILLS

Vegetables: During this month there is generally either very heavy rain or a long break and there is not much to be done in the way of sowings out of doors. The most important operation now is to see that the heavy rain does not wash away any young seedlings put out last month.

Fruits: Apples, Pears, and Apricots will now be fit to pluck. The trees generally become very much exhausted, and the sooner the fruit is removed, the better for trees. Grafting may be done in this month, as well as budding of Peaches.

Flowers: Cuttings of Begonias, Geraniums, Fuchsias etc., may still be put down in sand in the hot-house. Hydrangea cuttings put down now will form fine plants by the end of March. Fuchsias make a great deal of growth this month, and should be kept properly staked. Dahlias will also require staking. A strict supervision should be kept over the

frames and houses, as it is at this time that a lot of mischief is done by plant pests. Roses may be budded during this month, and cuttings of China, Tea and Bourbon varieties put down in glazed frames.

PHOSPHATIC FERTILISER

The important of phosphatic manures in agriculture is undisputed. These serve at least five purposes in the soil:

1. They cause an earlier development of the young plant than would otherwise occur.

2. They bring about a considerable development of fibrous roots.

3. They counteract the rankness of growth which is liable to occur on land richly supplied with nitrogen compounds.

4. They hasten ripening and improve the quality of grain.

5. They increase the feeding value of the ordinary fodder crops.

PRUNING

Pruning is the art of removing certain portains of plants with a view to symmetry or the production of more and superior fruits and flowers. It consists of two distinct operation—the cuttin out of branches that have reached a considerable size or are decayed or weakly, and the removal of the points of growing shoots. The first operation should be performed only when the tree has nearly finished its growth for the season, because at this time the sap is not running upwards so rapidly as it is at other times, and the wound heals rapidly. If a branch is cut off a short time before the tree begins to grow probably a large quantity of sap will escape at the still fresh wound, and the tree will be greatly weakened by the loss; this is technically called bleeding. The second operation—cutting out the points of growing shoots—may be performed when the plant is in full growth; this system is suitable for keeping herbaceous or soft-wooded plants symmetrical. Sharp tools are necessary in pruning because the wound made a sharp tool heals quickly than a ragged wound will do. If it is practicable to cut a branch with a pruning knife, the result is better than any kind of shears products because shears are rarely in the perfectly sharp condition necessary for making a wound without bruising the tissues. A saw with an extra thick blade or a thin blade strengthened by a frame is suitable, but the wound made by saw should be dressed at the edges with a pruning knife.

Scientific Researches and Inventions

NEW DEVICE FOR RETAIL STORES

Many new devices, fixtures and materials for retail stores were, it is reported, shown at the National Store Modernisation, Building and Maintenance show recently held in New York. They ranged from electric floor cleaners to shelving that can be assembled or changed in a few minutes, without tools, to display any kind or size of merchandise. Ease of installation and cleaning characterised the many new materials for wall decorations and fixtures. The new lighting devices showed a continued trend toward inconspicuous light sources—enhancing the merchandise rather than making a pretty fixture. In the lighting displays were controlled spotlights and variable colour-projection devices.

One of the mechanical devices shown was a small conveyor rail on which racks of clothing can be moved both horizontally and vertically. With this device the racks can be easily switched from an eye-level position on the sales floor to permanent hanging space in another section of the store. It was said to be suitable both for large retail stores and clothing manufacturers.

NYLON AS INSULATOR

Nylon is generally used in clothing. Now it is veteran in the insulating field also. It is reported that during the last year more than 250,000 pounds of nylon were used for insulation, mostly in wrapping the wire in magnets and coils and transformers in a large variety of electronic devices, such as radar and sonar.

According to latest information Dacron polyvester fibre will also soon be used as an electrical insulator. Dacron has high tensile strength, resistance to deterioration by heat and chemicals, stretch resistance and low moisture absorbance. The textile can be made tougher than asbestos and is easy to apply as an insulating cover, the fibre is therefore now undergoing wide commercial evaluation as an insulating material. Acrylic fibre also shows promise as an insulating material being used at present as insulation for electro magnet wire. It winds readily, and resists weathering and acid gasses in the air.

PLASTIC SPRAY IN DRESSING WOUNDS

A transparent plastic surgical dressing, developed by the U. S. Air Force for possible use in widespread disasters,, may be used in general treatment of many types of wounds according to Air Force medical officials.

In tests the plastic dressing, known as "aeroplast," which is sprayed on the injured area, has already proved effective protection for wounds. Doctors believe aeroplast may someday supplant gauze bandages in treating victims of catastrophes.

The plastic dressing is applied directly to injured parts of the body with a pressurised container that sprays a thin film over the wound. While healing, the cut or burn can be quickly and easily inspected through the transparent surface, or the hardened plastic coat can be peeled off intact without injuring the wound and a new layer can be applied.

Aeroplast has numerous advantages easily covered with gauze bandages. Further aeroplast's partial flexibility allows the patient more freedom of movement.

Aeroplast has other benefits. An untrained person, for example, can apply the plastic dressing. During an emergency, volunteers, treating the injured with aeroplast, might spare doctors for more urgent work. Furthermore, aeroplast is less expensive than gauze. Occupying less

storage space, great quantities of it can be quickly transported from one disaster-area to another. Unlike regular dressings, aeroplast does not require periodic re-sterilisation.

The plastic dressing will not stop infection in a wound, researchers point out, but it will prevent infection of a wound that is cleaned before aeroplast is applied.

STREET LAMPS SWITCHED ON BY RADIO

If the Federal Communications Commission gives its permission, New York City, it is reported, may soon have radio-controlled street ligths. According to a report in *Science Digest*, the city has asked F. C. C.'s permission that the power of a city-owned broadcast station be "momentarily increased twice a day for purposes of sending out a control signal. The signal would be picked up by 12-inch antennas on top of each lamp post and fed to a 1-tube miniature receiver placed inside the stanchion. The incoming signal sets off a really turning the light switch on or off. If sudden storms or thick fogs that often darken the city during the day occur, the lights can be turned on quickly by an extra signal.

CHLOROPHYLL INDUSTRY IN INDIA

Research is at present being conducted at the Forest Research Institute, Dehra Dun, to help the establishment of chlorophyll industry in India.

The Institute has published several papers on the subject, which have suggested the chlorophyll pigment for the coloration of vanaspati to prevent its use as an adulterant of ghee. The yellowish-green colour of vanaspati thus obtained can be recognized even after great dilution by brilliant reddish flourescence under ultra-violet light or bright sunlight.

During the past few years, the Institute has been engaged in the preparation of chlorophyll concentrates and products from the leafy sources of both forest and agricultural origin as well as in the development of their quatity and number. The Indian stinging nettle, palak and bhant have, among others, been found to be sources of chlorophyll.

The chlorophyll pigment has no deleterious effect on human beings. On the other hand, it is said to cure certain cases of anaemia and to have vitamin-like activity. It is, in fact, hailed as a life-giving substance beneficial for human metabolism.

The total pigment used for colouring vanaspati also contains carotenes already recommended for its "fortification" as a pro-vitamin "A". A rapid, simple and economic method has been evolved for the coloration of vanaspati with chlorophyll by direct extraction from the leafy source with the fat itself.

COPPER CHLOROPHYLL

A process has also been developed at the Institute for the preparation of copper chlorophyll. Copper chlorophyll of 120-140% tinctorial value is obtained in an yield of 60-70 grams per kilogram of dry leaves of the Indian stinging nettle. Besides being used as a colorant for soaps and oils, it forms a base for preparing water-soluble copper chlorophyll, widely employed in America in a variety of preparations, such as de-odorant tables, breath candies, air fresheners, mouth washes, tooth pastes and chewing gums, and even in facial creams and other ointments.

Water-soluble chlorophyll without copper has also been prepared from the edible leaves of both forest and agricultural origin. This product is intended only for edible purposes and serves as a tonic and a deodorant.

Copper chlorophyll extract has been prepared from a herb reputed to be an insecticide, and is potentially of great value in tissue-stimulating and wound-healing ointments.

PHOTOELECTRIC TYPE-SETTING

Information has been received that photoelectric typesetting machines which eliminate the use of metal type in commercial printing are now in production at Cambridge, Massachusetts. The new development, it is reported, photographs characters on a revolving disc and produces a film from which the desired copy is photoengraved on plates for printing. The process was invented by Rene A. Higonnet and Louis M. Moyroud, two French telephone engineers, and developed by Photon, an American firm.

PHOTOGRAPHING THE SUN

It is reported that some scientists in Britain are now putting finishing touches to a giant plastic balloon which is to carry a telescope camera to a height of 80,000 ft. to obtain unique pictures of the sun. This novel expedition of remote-control astronomy is expected to be staged soon. The main aim is to photograph the corona—the area of faint light surrounding the sun and normally visible only during a total eclipse. By sending an automatic camera fitted to a big telescope to 80,000 ft. by a special balloon, astronomers hope to defeat the dust and haze obscuring the sky at lower hights and so get clearer pictures than have ever been achieved before. In taking the photographs, a mirror mechanism ensures that one mirror collects light from the sun and sends it up a telescope tube, and it is then reflected by a second mirror at the top of the tube down into the camera. A further mechanism will operate the parachute to bring telescope and camera down to earth. The equipment will be in a special waterproof casing which will float it if lands in the sea.

According to the information Professor Roderick Redman, Chief of the Astrophysics Department of Cambridge University, is controlling the preparation of the telescope camera and its ancillary equipment, while the great plastic balloon, measuring 120 ft. in diameter, is the work of Nobel Prize winner Professor Cecil F. Powell, of Bristol University, and his team of assistants. Bristol University has long taken the lead in experiments with giant hydrogen-filled balloons for cosmic-ray research, and one of its products is now being used in a cosmic-ray expedition operating from Sardinia. Professor Powell is hopeful that "from the thousands of photographs with the camera operating every five seconds, we shall obtain at least a few good pictures."

NEW ATOMIC PLANT "BREEDS" OWN FUEL

The development of a power plant capable of producing new nuclear fuel at least as rapidly as it consumes other fuel, announced recently by Gordon Dean, Chairman of the U. S. Atomic Energy Commission, is hailed as "a milestone in the development of atomic energy." Without question, the achievement is a significant one. It has brought the world a step closer to an era of enormous promise, the atomic age. It has not, however, made that a reality. Only time and research—much more research—can do that. It is important to keep in proper perspective this latest advance made in the field of atomic energy in announcing the development Chairman Dean was careful to make these points:

1. It does not mean that economic power from atomic fuels is possible at this time.

2. It does not mean that urenium can be regarded as a virtually costless fuel,

nor that the need for raw uranium ore has suddenly diminished.

What the discovery does mean, Dean said, is that eventually every piece of uranium extracted from the earth can be used as atomic fuel. Moreover, it is possible that thorium, a relatively plentiful element, may also be utilised. Only seven-tenths of one per cent. of uranium is fissionable, or can be burned, in its natural state. This portion is known as U-235. The remainder is called U-238. Power from uranium is obtained through the use of atomic reactors, or furnaces. When sufficient fuel is placed in a reactor, the physical equivalent of spontaneous combustion sets in, releasing tremendous amounts of energy in the form of heat. When U-235 is burned or exploded, in the presence of U-238, a rearrangement of atoms occurs in the latter ore and a new element, plutonium, is formed. Plutonium can be used in the same manner as U-235.

As a result of the latest discovery, it is now possible for special reactors to burn U-235 for power and at the same time create plutonium at a rate at least equal to that at which U-235 is being consumed. The new process is known as "breeding." The reactor employed in the successful breeding experiment is located at Arco, Idaho. It has been generating electric power, in experiments, since December 20, 1951. On that day, for the first time in history, a turbine was operated with steam made from the heat of an atomic furnace. Breeding is a costly proposition at present. The reaction may have to operate five years or more before it yields as much new fuel as was invested in it originally. There are however intriguing long-range possibilities. Known reserves of uranium and thorium have an energy potential which dwarfs that of all other fuels. The cost of fossil fuels such as coal and oil, is rising while the cost of nuclear power production can be expected to decline. Sometime in the future, those cost curves will meet and the world will find the atom providing power for transportation, home and industry.

SHOCK ABSORBER FOR PLANES

A shock absorber to take the bumps out of aircraft flying is reported by Taylorcraft. Inc. of Conway, Pennsylvania. The airplane manufacturer announced recently that Earl Metzler, of Latrobe, Pennsylvania, has invented an attachment that works in flight much as do auto-bile springs when a car is travelling over a bumpy road. This "air shock absorber" attaches to a wing strut and flexes like a spring when the plane gets hit by such forces as wind gusts. Metzler maintains it will reduce air-sickness and increase lateral stability of planes. Taylorcraft has tested the device on experimental flights for several months. The company says it will be low-priced.

COAL-"SHIPPING" THROUGH PIPELINES

The Pittsburgh Consolidation Coal Company of Cadiz, Ohio, has found a method of "shipping" coal through pipelnies that is cheaper than shipment by rail or any other system. The company crushes the coal and pumps it through a 12-inch pipeline more than eleven miles long. The lumps of coal are crushed power-fine, mixed with water and shot through the pipeline at a rate of thousands of tons a day. Then the coal is removed from the water at the terminal. The system handles 1,500 tons of raw coal and turns out 1,275 tons of cleaned coal every hour.

Manufacturers and Suppliers are invited to give notice in this paper of new products or developments. Description should be brief and blocks or stereos not more than 2½" wide, 85 screen for halftones.

USE OF FLEXIBLE RUBBER BAGS IN MEDICAL FIELD

A flexible cast that hardens instantly and can be used over and over for more comfortable and efficient immobilization of patients undergoing X-ray and other types of medical treatment is now in use in cancer clinics. The device, made by the Dewey and A'my Chemical Co., Cambridge, Mass, and known as Flexi-Cast, is also a flexible mould, and is also being used to make instant impressions for plaster casts and for other radiotherapeutic purposes.

Flexi-Cast consists of a thin-walled rubber bag filled with fine-grained plastic granules. A vacuum pump is attached by means of a rubber tube. The bag can be manipulated to fit closely around any part of the human body or all of it. When the bag is adjusted, the pump turned on, and the air withdrawn, the bag instantly becomes rigid and rock hard. Although the patient feels no pressure or discomfort, the part of his body surrounded by the bag cannot be moved until the vacuum is released. When only part of the air is withdawn, the bag is malleable and can be moulded like putty. Employment of the flexible cast eliminates the boiler and discomfort of straps, sandbags and other cumbersome devices used previously, and is said to be faster and more effective for doctors in their work.

Used as a cast, immobilize a patient undergoing radiotherapy, the portion of the body to be treated—the patient's head, for example—is placed upon the bage and accurately positioned so as to receive the X-ray beam in the precise spot of cancerous growth. The bag is then manually moulded or built up around, but not covering, the patient's face. When the air is exhausted, the bag immediately becomes rigid without losing its moulded shape, and the patient cannot move his head. He feels no sense of restraint during the process, and usually is unaware that the bag become rigid until he tries to turn his head. Bags of varying sizes and shapes are used to immobilize or support different parts of the body, including a full length bag which can "Freeze" the entire body.

When used as a mould, the device provides a faster, cleaner method of making negative moulds or impressions of the force, head and other parts of the body. In making a facial mould, the bag is pressed momentarily over the patient's face, and the air is withdrawn. When removed from the face, result is a negative mould into which plaster of paris is poured. Within 10 to 15 minutes, the plaster has hardened. Then the vacuum is released and bag falls away, leaving a model of the face. While fine details are not reproduced, the device does provide a quick and accurate cast showing the bony structure and facial contours. Such casts are used as an aid in calculating and aiming the X-ray beam.

NEW SMALL DIESEL AIDS THE FARMER

A new small Diesel engine has just been introuced by a British firm. During a four years' test, made under rigorous practical conditions to discover any

weakness that might develop, one of the prototype engines ran over 400,000,000 revolutions. The engine provides from 5 h.p. at 1,000 r.p.m. to 8 h.p. at 1,500 r.p.m. Easily started and quiet-running, it is designed to meet all requirements for a small prime mover in Britain and abroad.

It is particularly suitable for manufacturers of contractors' plant, agricultural machinery and Diesel-electric sets,and is already in considerable demand from overseas, principally for agricultural and irrigation purposes. Demand for the Diesel for water-pumping for agricultural purposes is particularly strong the company reports. The makers have a large export trade and last year sold their products to more than 50 countries.

PREVENTION OF RUST ON SAFETY RAZOR BLADES

Users of safety razor may have noticed a curious kind of rust that sometimes affects their blades. When the wrapping is opened the blade looks as though a tiny worm has been wandering about on the surface of the blade leaving a pattern of corrosion in its path. Blades affected in this way are usually not much good: they suffer from what scientists call Filiform cause of the corrosion, which may be moisture, moist dust or ash in the factory, really does move over the blade like a worm. Its "head" seeks out the easiest path to travel, and rusts the blade in so doing.

The corrosion can be prevented. The obvious way is to get rid of the moisture or dirt in the factory. But the British National Chemical Research Laboratory at Teddington, Middlesex, has found that wrapping paper impregnated with sodium benzoate prevents its development. Filiform corrosion, one of the problems on which the Laboratory is working, is important because it can affect other things made of steel as well as razor blades.

ELECTRONICS AID THE INDUSTRY

More and more, in science and in industry, electronic measuring is taking over from old and established ways of determining physical quantities. There is hardly any industry, be it in the electrical, mechanical or chemical field, where electronics cannot be applied. Many a factory manager has no idea where electronics can help him towards higher, better and cheaper production.

One of the many applications of electronics in the sugar industry is the determination of ash content in syrups. It has been proved that a certain relation exists between the ash content as a percentage and the conductivity of sugar syrups. By means of a conductivity measuring bridge the ash content can be determined to two decimal places. Such a measuring equipment is very simple to operate, so that it lends itself for use by untrained personnel.

The method of working is quick and simple. A small quantity of sugar, say, 10 grams, is dissolved in pure distilled water and further diluted. A glass cell is then connected to a measuring bridge which is a small and portable instrument built on the principles of the Whetstone bridge. To avoid polarisation and gas development between the electrodes the voltage is not d.c. but a.c. with a frequency of for instance, 1000 c/s. An oscilator built in the bridge generates this a.c. voltage. By adjusting the bridge the exact electrical (ohmic) resistance of the liquid between the platinum electrodes can be measured. From this value the specific resistance can be deducted and again from the resistance the conductivity is determined. By means of a table, supplied with the instrument, the percentage of ash content can be found.

The conductivity of a sugar solution is dependent on the temperature. With a thermometer the temperature of the liquid

is measured. An extra correction table is supplied too so that when the temperature is known the necessary correction of the value of the ash content can be read and taken into account. The distilled water used to dilute the sugar has a conductivity of its own. This figure has of course to be deducted from the conductivity of the sugar solution.

Ash contents ranging from 0.0000 per cent. to 3.000 per cent. can be determined with great accuracy.

A NEW MACHINE FOR FARMERS

Described by the makers as the greatest invention since the introduction of the electric fence, a British firm of agricultural-machinery manufacturers has invented "Portapylon," a simple idea—in effect, light, easily moved supports for the wire of an electric fence. A "Portapylon," a specially designed unbreakable insulator, and a "quick-fix" insulator assembly (permitting the insulator to be moved up or down the "Portapylon" as required) are all that are necessary.

A NEW HEDGE CUTTER

The "Hedgemaster," a portable electric model designed hedge cutter for farm and roadside hedges—owing to its robust design is not damaged by the wire so often encountered in hedges. Dynamo attachments (for most of the well-known tractors and horticultural scythes) or a generating set provide the electricity. The "Hedgemaster" is a personally operated tool, and it is therefore possible to cut the hedge in exactly the right places, at the base of new growth.

BUTTON BLANKS FOR EASY MACHINING

A British firm has recently introduced a range of "Supertone" button blanks moulded in urea formaldehyde which has been specially developed for easy machining and polishing. They are available in various basic shapes, and are always correct in measurements covering a normal range of sizes.

These button blanks are available either translucent or opaque, and have great depth of colour. The range of colours is practically unlimited, but special shades can be supplied to order, cream or blonde are supplied when the button manufacturer wishes to do his own dyeing. As these "Supertone" blanks reach the customer in a highly polished state, it is generally unnecessary to apply a further polish.

IMPROVED TWO-WHEEL TRACTOR

A new, improved version of the "Auto-Culto" two-wheeled tractor has been announced by the manufacturers, an old-established firm of agricultural-machinery makers which introduced the first two-wheeled tractor ever to be made in England in 1925. The largest model now made is powered by a 4½hp. "Villiers" engine, for petrol or paraffin operation, with a centrifugal friction clutch, two forward speeds and a reverse, power turning and wheels which are extendable from 26 inch to 45 inch. In addition, the latest type of plough is a quick-lift one which makes the operator's task easier.

The latest rotary cultivating attachment has a solid shaft drive with universal joints to do away with the necessity for lining the attachment up correctly on fitting. The tractor will take the following range of "Auto-Culto" equipment: cultivators, disks, seers, ridgers, trailer roller, tineharrow, hedge trimmer and, when required, H. P. pump (450 pressure on two guns at a time), rotary cultivator, side mower and front mower.

MULTI-PURPOSE REPAIR KIT

Though mainly intended for the repair of motor-car tubes and tyres, many

other uses are claimed for the Bowes "Seal-Fast" repair it manufactured by a British firm.

With the aid of a "Seal-Fast" kit a puncture can be mended in a fraction of the time taken when using a conventional repair outfit. No adhesive is required for sealing the inner tubes, and the manufacturers claim that with wear the repair patch actually becomes part of the tube and is impossible to remove.

The Bowes "Seal-Fast" method can also be used for applying valves stems and for repairs to such articles as gum boots, hot-water bottles, hoses and conveyor and driving belts.

FLAME-PROOF THERMOSTAT

To meet the growing needs of safety in the mines, and to protect against serious damage the mechanism of valuable air compressors often employed in-by, a special version of a flame-proof thermostat has been developed by a British company. This equipment comprises a wall of bracket-fixing flame-proof enclosure, which houses the thermostat switch itself, the latter being operated by a sensitive phial via a length of armoured capillary tubing.

Any substantial rise in temperature on the compressor conveyed to the air outlet and, therefore, the sensitive phial is inserted in the supply line as close as possible to the discharge point.

BOILER FEED MOTOR

A British electrical company is now producing a 1,225-hp, 2,980-rpm. squirrel-cage motor specially designed for driving feed pumps. Boiler feed pump drives are a vital service: the motors have to run continuously on full load for periods of several month at a time, and they must be absolutely reliable. For these reasons, and in view of the high speed and the motor weight of this relatively large machine, it was decided that pedestal sleeve bearings should be used.

To ensure that the bearings are adequately lubricated and cooled, a constant oil flow system has been incorporated. Filtered oil is circulated through the bearings by a pump geared to the main motor shaft, and it returns to a tank mounted on the bedplate. This tank acts as both reservoir and oil-cooler. The bearings are also fitted with the normal oil rings, which provide a sufficient supply of oil during the starting period, they also ensure that the bearings are not damaged in the unlikely event of shutdown due to a failure in the forced-oil circulating system.

HARD-CHROME PLATING OUTFIT

A self-contained hard-chrome plating outfit is being introduced by a London manufacturer. The bench model is compact and simple to operate. When the control panel for the required current density and deposition time has been preset, the instrument rings a bell when the object to be plated has been properly coated. The outfit, with its plug-connected to any ordinary AC mains socket outlet, embodies a dry disk selenium full-wave rectifier which delivers DC across the bath.

Success depends upon the use of "Chromasol' electrolyte, the composition of which solution has not been revealed. Plating to the desired tolerance is accomplished simply by gauging the time of immersion in the vat. Every three minutes a uniform deposit 0.000 lin. thick is applied to the surface of the object being coated. The outfit seems very suitable for reducing corrosion and wear, building up worn parts and prolonging the service life of cutting tools used by machinists.

JAPANESE DESIRE

Addressing a recent Press Conference in Calcutta, Mr. Yoshiteru Kogane, leader of the five-member Japanese Economic Survey Mission, said that Japan would like to enter into a technical co-operation agreement with India. The nature of the agreement, Japan has in view, seems such as would benefit both countries concerned. Mr. Kogane has already had talks on the matter with the Planning Commission and the Indian Government Officials in Delhi. He said that the idea was not opposed by either the Commission or the Officials referred to. The agreement under discussion here will provide to India the facility of sending Indian students to Japan for technical training. Besides, Japan desires to send technical experts to India. Mr. Kogane advocates economic co-operation between India and Japan. Referring to the existing competition between the two in textiles, Mr. Kogane said that a solution to it might be found in the fact that Japan's emphasis was mostly on finer qualities of textile goods.

MONETARY TRENDS

The Report of the I.M.F. for 1952-53 on the world monetary trends strikes a note of optimism. It says that substantial progress has been made during the year under review in the direction of general payments balance. The world's balance of payments with the dollar area in 1952-53 has improved.

We are reproducing below in a summarised form some of the principal points made in the I.M.F.'s latest annual report. These are:—

(1) Despite the downward trend in world trade that became evident early in 1952, the world's payments position as a whole in 1952-53 showed a much better balance than in 1951.

(2) The widespread payments crisis at the beginning of 1952 affected particularly the raw material exporting countries.

(3) The most significant statistical evidence of the improvement in the world payments position in 1952 is the balance of payments of the rest of the world with the U. S. A.

(4) The supply position outside the dollar has also improved on the whole, as a result, in part, of the abatement of inflationary pressures.

(5) It would be rash to take it for granted that the battle against inflation has now been won. It is significant that, in many parts of Europe, the inflationary impact of rising defence expenditures was kept in check throughout 1952.

(6) In 1952, as in 1951, the overall inflationary tendencies were stronger in the raw material producing countries than in the industrial nations.

FAO'S REPORT

The FAO'S Report on the state of food and agriculture points out that for the first time since the end of World War II, the world's output of food caught up with the growth in world population in 1953. In the Far East there was a record rice crop; agricultural output in Oceania went up by 10 per cent. over the 1951-52 figures. North America recorded increased supplies. Agricultural output rose in North-Western Europe by 2 per cent. and in Latin America by 9 per cent.

Speaking of Asia and the Far East the Report strikes a note of caution. In this region food production has gone up and its pre-war level of output has been restored. But population too has risen and

there is still a big gap between food production and population. The same is the case in regard to the other underdeveloped regions of the world. Not less than 70 per cent. of the world's total population live in these regions. Mr. Dodd, Director-General of the FAO makes the following two points which are well worth considering:—

(1) He points out that attention must be paid to the problem of raising the productivity in the underdeveloped regions and unless it is solved the grinding poverty of their rural population cannot be alleviated to any perceptible extent.

(2) "If allowance is made for qualifying a calorie content, the average diets for persons in North America, Western Europe, Australia and New Zealand are two to three times those of most of underdeveloped regions whether measured in money values, original calories or the agricultural resources needed to produce them."

WORLD BANK LOANS

On the 4th September the International Bank for Reconstruction and Development made four loans to new countries, Nicaragua and Iceland. Iceland received two loans. One of these is in European currencies equivalent to 1.35 m. dollars for carrying forward a programme of agricultural development. The other amounts to 252,000 dollars and is meant for the construction of a building to house radio transmitter equipment serving North Atlantic air traffic. The loans are for a period of 12 months and bear interest at 4¾ per cent. including statutory commission of 1 per cent. Amortization payment will begin on 15th July, 1954.

Nicaragua received two loans amounting to 3.95 m. dollars. A sum of 3.5 m. dollars is for highway construction and the remaining amount of .45 m. dollars is meant for electric power. The loans will run for a period of 10 years and bear interest at the rate of 4¾ per cent. including 1 per cent. commission. Amortization payment will begin on 15th March, 1957.

PAKISTANI IMPORTS

Pakistan is reported to have decided to import cotton piece-goods worth Rs. 15 crores during the coming year. Out of the total amount Rs. 3.5 crores are intended for imports of cotton piece-goods from Japan. During 1952-53 Pakistan imported about Rs. 9 crores worth of piece-goods as against Rs. 37 crores spent in 1951-52 for the same purpose. Import of cotton yarn too fell from Rs. 25 crores to Rs. 6 crores. The restricted imports were on account of Pakistan's policy of restricted imports. But recently she has made up her mind to relax it. Her people will certainly welcome relaxation of restrictions on imports but, perhaps, look forward to a still more liberal policy. While not regretting her choice to buy from distant Japan, we would like our neighbour not to forget that the hardships her people have to bear for having to buy cloth at high prices, can be liquidated only by the cementation of closer trade ties between India and Pakistan.

U. S. TIN IMPORTS

In the first quarter of 1953 the U. S. A. imported 42 m. dollars worth of tin as against the 1952 quarterly average of 38 m. dollars. She imported from Indonesia ore worth 6.15 m. dollars. Both volume and value of the imports from Indonesia went up. Tin imports from Malaya stood at 31 m. dollars, almost the same as in the previous year. The increased consumption of tin in the U. S. A. is due to the current level of economic activity in the tin-consuming industries like automobiles and trucks, railroad equipment, aircraft, air-conditioning, and radio and television.

DEVELOPMENT OF HANDLOOM

In accordance with the recommendations of the All-India Handloom Board, the Government of India have set up a Central Marketing Organisation for handlooms with its headquarters at Madras. Branch offices will be opened shortly at Madras, Banaras and Bombay.

The purpose of the Central Maketing Organisation will, in the initial stages, be directed mainly to the promotion of the organisation of weavers in different states in the Indian Union on co-operative lines. It will also deal inter alia with the development of internal and interstate marketing.

The Handloom Board has recommended estabilshments of regional organisations in Nagpur, Gwalior, Calcutta, Banaras, Bombay and Madras. The question of opening organisations in other countries as recommended by the Board is under consideration of Government.

ENCOURAGING USE OF DIESEL ENGINES

Reports from New Delhi indicate that the Government of India has decided to encourage the use of diesel engines in place of Otto engines (or petrol engines, in common parlance) in all nationalised road transport undertakings in the country. This decision follows the unanimous agreement among the transport organisations, under the auspices of the Central and State Governments at the Second All-India Transport Commissioners' Conference, held in Kashmir in May last, to switch over, as far as possible, nationalised road transport from petrol to diesel operation. The Tariff Commission it may be recalled, has recommended, in its report on the automobile industry, the use of diesel engines for heavy commercial trucks and heavy passenger vehicles.

Although a diesel engine costs more than an Otto engine, and the initial costs are higher, it is more economical. The thermal efficiency of the diesel cycle is considerably higher than that of Otto cycle. Again, the maintenance cost per mile is one-half to two-thirds of an Otto engine. Further there is less danger of fire in the case of diesel than in that of Otto engines. Experiments have shown that the diesel can be used even on steep roads without loss of power by the vehicle.

There are also certain other advantages. Diesel oil is cheaper by some 20 per cet. than petrol. Although the calorific value per lb. of petrol and diesel oil is the same, the specific gravity of diesel oil is higher than that of petrol by 16 per cent. This, together with the higher thermal efficiency of the diesel engine, explains why the fuel consumption of a diesel truck is 35 per cent. lower than a petrol-driven truck. If the power which an Otto engine generates out of one gallon of petrol is taken as 100, the power which a diesel produces out of one gallon of diesel oil is approximately 155, that is, a gallon of diesel oil theoretically gives 55 per cent. more mileage than a gallon of petrol. Lower fuel consumption and lesser fuel price together serve to reduce the fuel cost for a diesel ton-mile by 50 per cent., as compared with a petrol vehicle. As India has to import all the motor oil, it follows that every ton-mile transported by diesel trucks, instead of petrol trucks, saves for India 50 per cene. foreign exchange. Only the use of diesel engines will serve further to restrict the already limited market for petrol-driven vehicles manufactured in the country. There is at present only one automobile firm in India which has plans for manufacturing diesel engines. There is also a proposal to start a factory in South India for the production of Benz type of diesel engine chasis.

PROBLEM OF PIECE-GOODS BUSINESS IN MADRAS

The following are extracts from the speech delivered by Mr. V. Devarajulu Chetty, President, Madras Piece-goods Merchants Association at the thirty-second annual general meeting.

The decontrol of about 30 varieties of mill cloth and the relaxation of export restrictions have been capable of finding only a temporary solution to the problem of surplus stocks and the steep fall in demand for mill cloth both within and without the country. The main question of lowering the prices of cloth still remains untackled. The price factor is the chief impediment that stands in the way of a normal demand for mill cloth within the country. The high ex-mill prices of cloth super-imposed by excise duty at high rates and the levy of multipoint sales tax by the State Governments make cloth dearer to the average consumer. The repeated requests made by the industry and the trade to abolish the unjustifiable levy of excise duty on mill cloth and also to restrict the levy of sales tax at one single point have all proved a cry in the wilderness. Unless these requests are acceded to, the demand for mill cloth within the country would not increase and the textile industry would sooner or later find itself in a very precarious position, when the mills will be forced either to cut down their production or to completely close their doors, bringing in its trail both unemployment and a shortage of cloth in the country.

In view of the increased output of cloth by the Indian mills, the slackness in demand from consumers within the country, the diminishing offtake of cloth by foreign markets, the easy availability of raw cotton, both indigenous and foreign, the cordial relations that exist between capital and labour, the day-to-day deepening of trade depression, the tightened money market conditions and the apparent slow down in the political tension between the two big power blocs, there appears to be no necessity to have any sort of control over textiles. The apprehension of the Government regarding the possibility of prices soaring up in the event of control over prices being removed did not at all materialize, but what really happened was just the reverse. Prices of almost all categories of cloth have slumped further soon after decontrol of certain varieties of cloth and stocks are available in plenty in one's own requirement at stamped prices or sometimes below at all places throughout the country. Price-stamped goods in the hands of dealears, although offered at lesser price, are not moving because of the steep fall in the purchasing power of average consumers. It is reported that huge stocks are getting accumulated with the mills with no prospect of buyers turning up to purchase such stocks. Certain mills are reported to be contemplating to suspend production on account of financial stringecy caused by accumulatin of stocks. What has been said of the mills applies with equal force to the textile trade also. In the light of these facts, there appears to be no justification for the continuance of control even on a sinile item of textiles a day longer. Control on textiles has long outlived its purpose and it would be a disservice done to the consumers, the industry and the trade if the Government were to keep up control any longer. Even though control has ceased to serve any useful purpose to the consumers since some time past, it is being kept up for reasons best known to the Government only.

Company Reports

Kumardhubi Fireclay and Silica Works, Ltd

The directors of the above Company (Managing Agents: Messrs. Bird & Co., Ltd., Calcutta) *submit the* audited accounts of the Company for the year ended 31st December, 1952.

The profit and loss account after allowing for sundry charges, provding for depreciation, taxation and placing Rs. 68,500 (Rs. 61,000) to the reserve for tax contingency, Rs. 75,000 (Rs. 1,00,000) to the reserve for plant renovation and Rs. 65,000 (*nil*) to general reserve and including the sum of Rs. 61,833 (Rs. 78,299) brought forward from the previous year, shows a credit balance of Rs. 2,26,448 (Rs. 2,42,058) which the directors propose to dispose of as follows:

In paying a dividend on the preference shares at the rate of 7 (7) per cent, per annum without any deduction for incom-tax paid by the Company Rs. 14,000 (Rs. 14,000), in paying a dividend on the redeemable preference shares at the rate of (5½) per cent. per annum, after deduction of income-tax paid by the Company Rs. 16,225 (Rs. 16,225), in paying a dividend, on the ordinary shares at the rate of Re. 1-8 (Re. 1-8) per share without any deduction for income-tax paid by the Company Rs. 1,50,000 (Rs. 1,50,000) and in carrying forward Rs 46,223 (61,833).

There was a temporary falling off in output of fire-bricks, but a Compensatory increase in the production of silica bricks, which the directors consider is likely to be permanent in view of the expansion of the steel industry. This is being met by the installation of additional machinery including another press. The Company's raw material position is satisfactory but is constantly under examination. Relations with labour were satisfactory.

Birpara Tea Co., Ltd

The directors of the above Company (Managing Agents: Messrs. Duncan Brothers & Co., Ltd., Calcutta) submit the audited accounts of the Company for the year ended 31st December, 1952.

The accounts disclose a loss of Rs. 6,27,038 (loss of Rs. 9,11,,230). On transfer of this sum to profit and loss account and after sundry adjustments. there is a balance at debit of profit and loss account of Rs. 10,16,394 (debit of Rs. 3,90,222), which the directors propose to carry forward.

Finer plucking together with a continuance of spasmodic labour trouble throughout the year are mainly responsible for the lower outturn. This fall in crop combined with the increaesd statutory wages to labour and an unfavourable market resulted in a heavy trading loss which would have been of even greater proportions had not prices improved towards the end of the season.

Crop weighed out at 15,604 maunds compared with 17,288 maunds in the previous year. The average selling price was Re. 1-1-2 per lb. against As. 12-5 per lb. in 1951. Planted area is now 1388.24 acres.

Estimates for 1953 provide for a crop of 16,000 maunds at an outlay of Rs. 14,00,100, including inland freight and sale charges.

SYRUP CALCIUM LACTOPHOSPHATE (B.P.)

Calcium lactate	75	grains.
Concentrated Phosphoric acid	45	mililitres.
Orange-flower water	25	,,
Refined sugar	700	grains.

Distilled water, sufficient to produce 1000 mililitres.

Mix the calcium lactate with 400 mililitres of the distilled water, and the concentrated phosphoric acid and stir until solution is complete, then add the orange-flower water, dissolve the refined sugar in the mixture without the aid of heat and add sufficient distilled water to produce the required volume; filter.

Dose : ½ to 1 fl. drachm.

THYMOL MOUTH-WASH ESSENCE

Dissolve 1 part of thymol in 99 parts of Eaude Bolot prepared from the following formula :—

Orris-root (cut small)	1½	oz.
Cinnamon in coarse powder)	6	dr.
Galangal (cut small)	6	,,
Cloves (coarsely bruised)	6	,,
Aniseed (coarsely bruised)	6	,,
Cochineal (finely ground)	72	gr.
Oil of pippermint	2-1/5	dr.
Balsam Peru	72	gr.
Coumarin	½	,,
Oil of orange flower	12	mins.
Otto rose	7	,,
Dilute alcohol	35	oz.

Macerate for 3 days, with frequent shaking, strain, press, and filter.

CHEST RUB

Camphor	15	parts by	weight.
Menthol	5	,,	,,
Methyl Salicylate	5	,,	,,
Eucalyptus Oil	5	,,	,,
Lanolin, Anhydrous	20	,,	,,
Paraffin Wax, soft	100	,,	,,

Melt and stir until uniform; pour into jars or tins at lowest possible temperature.

INSECT REPELLENT CREAM

Beeswax	3 — 4	parts by	weight.
Citronella Oil	15	,,	,,
Spirits of Camphor	8	,,	,,
Cedar Wood Oil	8	,,	,,
White Petrolatum	60	,,	,,

Melt petrolatum and beeswax, then add other constituents and stir until smooth.

PILE OINTMENT

Yellow Petrolatum	53	parts by	weight.
Lanolin Anhydrous	30	,,	,,
Yellow Beeswax	5	,,	,,
Ethyl Amino Benzoate	5	,,	,,
Bismuth Subgallate	5	,,	,,
Thymol Iodide	2	,,	,,

Melt yellow petrolatum, lanolin and beeswax together and allow to cool. Mix the three powders and triturate with a portion of the ointment base until smooth. Then add gradually the remainder of the base and mix until ointment is homogeneous. Note : This ointment must not come in contact with iron as discolouration will result so only porcelain or wooden utensils should be used.

AGUE MIXTURE

Quinine sulphate	½	dr.
Sulphuric acid dil	½	,,
Syrup of orange	1	oz.
Glycerine	4	dr.
Water to make	8	oz.

Dissolve the quinine in the sulphuric acid then add the glycerine and syrup. Lastly make up the required volume by adding water. Dose 1 oz.

LIQ. BISMUTH ET AMMON CITRAS

Bismuth subnitrate	1	oz.	175	gr.
Citric acid, in powder	1	,,	17½	,,
Dilute solution of ammonia	q.s.			
Distilled water to make	20	fl. oz.		

Mix the citric acid and bismuth subnitrate in a cc (20 mins) of distilled water. Heat the mixture on a water-bath until a small portion is completely soluble in dilute solution of ammonia. Transfer the mixture to a filter and wash with distilled water until the washings give no reaction for nitrate. Add to the washed residue just sufficient dilute solution of ammonia to dissolve it, and then add sufficient dilute solution of ammonia to dissolve it, and then add sufficient distilled water to produce the required volume.

CHAULMOOGRA OINTMENT (B.P.)

Chaulmoogra oil	10	grams.
Hard Paraffin	40	„
White Soft Paraffin	50	„

Melt the hard and soft paraffin together, add the chaulmoogra oil, and stir until cold.

EAR DROPS FOR REMOVING WAX

Ether	1	fl. oz.
Chloroform	1	„ „
Almond oil	2	„ „

Mix.

LYSOL

Cresol	500	c.c.
Linseed oil	180	grms.
Potassium hydroxide	42	„
Distilled water sufficient to produce	1000	c.c.

Dissolve the potassium hydroxide in 250 c.c. of distilled water, add the linseed oil, and heat on a water-bath, mixing thoroughly; continue to heat until a small portion dissolves in water without the separation of oil drops, add the cresol, mix thoroughly, and add sufficient distilled water to produce the required volume.

COMPOUND RESORCINOL OINTMENT

Resorcinol	60	grams.
Zinc oxide	60	„
Bismuth subnitrate	60	„
Birch tar	60	„
Petrolatum	250	„
Yellow beeswax	100	„
Wool fat	280	„
Glycerin	130	„

Mix the beeswax and wool fat in a dish on a water bath. Rub the zinc oxide and bismuth subnitrate with the petrolatum until smooth and add it to the melted mixture. Dissolve the resorcinol in the glycerin, incorporate the solution with the warm mixture, just prepared, then add the oil and stir the ointment until it congeals.

It is an excellent cure for ringworm, eczema, itches, and other skin diseases.

LIQUID MEDICATED SOAP

Coconut oil	1	oz.
Potassium hydroxide	1	dram.
Sodium hydroxide	1	„
Thymol	5	grains.
Distilled water to produce	6	ounces.

Dissolve the sodium hydroxide in one ounce of distilled water and dissolve in a separate vessel the potassium hydroxide in another ounce of water. Now place the coconut oil in a suitable pot and pour the sodium hydroxide solution stirring vigorously until all the sodium compound has been absorbed by the oil. Then add the potassium hydroxide solution and again stir so as to saponify the whole of the coconut oil. Then incorporate the thymol and allow the soap to stand for 15 minutes. Afterwards add the remainder of the distilled water.

TINCTURE BENZOIN COMPOUND

Benzoin, in powder	100	grams.
Storax	75	„
Balsam tolu	25	„
Aloes	20	„
Alcohol 90 p.c. to make	1000	c.c.

Macerate the benzoin, storax, balsam tolu, and aloes with 800 c.c. of alcohol in a closed vessel for 2 days, shaking occasionally; filter, pass sufficient of the alcohol through the filter to produce the required volume.

ANT POISON

Sugar	1	lb.
Water	1	quart.
Arsenate of soda	125	grains.

Boil all together and stir until uniform; strain through muslin; add a spoonful of honey the preparation being poisonous should be used with caution.

BINDI PASTE

Carmine	15	parts.
Gum arabic powder	5	„
Rose Water	sufficient quantity.	

Macerate the first two ingredients with rose water in a stone or porcelain mortar. Add a little boric acid and put in phials.

BOBBIN ENAMEL

Shellac	120	parts.
Alcohol	130	„

Mix until dissolved and then add

Castor oil	1	part.
Pigment	20	parts.
Toluol	2	„

CHOCOLATE PEANUT BARS

Sugar	3	lbs.
Corn Syrup	3	„
Water	1	pint.

Cook to 240°F then add 8 pounds of roasted peanuts, and cook for 10 minutes. Remove from fire, and roll out on slab. Cut into small pieces, and then dip in chocolate.

CURRY POWDER

Coriander seed	48	parts.
Ginger	3	„
Turmeric	24	„
Cinnamon	16	„
Cumin seed	8	„
Fenugreek seed	4	„
Cayenne pepper	3	„
Pimento	2	„
Black pepper	1	part.
Long pepper	1	„
Cloves	1	„
Nutmeg	1	„

Reduce the ingredients into fine powder and mix thoroughly.

ETCHING CREAM

Etching cream used for marking glass consists of equal parts of ammonium fluoride and barium sulphate made into a cream with hydrofluoric acid. This is applied to the glass by means of a rubber stamp allowed to remain for 12 hours, then washed off.

INDIAN FUMIGATING PASTILLES

Pulverised sanderswood	500	parts.
Benzoin	750	„
Tolu balsam	125	„
Sandalwood oil	5	„
Cinnamon oil	5	„
Cloves oil	5	„
Potassium nitrate	5	„

Reduce the solid ingredients into fine powders and then mix together. Now make into a paste with a solution of gum tragacanth so as to form into cones.

RUBBER STAMP INKS

To prepare these inks boil in enamelled vessel :—

Water	14	oz.
Stir into it gum arabic	10	„
Glycerine	14	„
Syrup	10	„

Mix well and strain through calico.

In 10 oz. of this fluid dissolve 1 oz. of any soluble aniline dye :—For black, use nigrosin; for blue, use methylene blue for green, use methyl green; for red, use eosin and fuschine; for violet, use methyl violet.

METAL POLISHING POWDER

Precipitated chalk	4	lbs.
Cream of tartar	½	lb.
Calcined magnesia	½	lb.

Take the other ingredients in fine powder and mix them together. Put in decorated tin boxes for sale. When required for use, take a small quantity of this powder, on a piece of moistened flannel and rub the articles to be polished. This powder is equally used for polishing gold, silver, German silver, brass, copper or any article on which a brilliant lustre is required.

ADHESIVE TAPES

Adhesive tapes are generally prepared with cotton fabric, or sometimes rayon. The fabric is coated with the following composition :—

Rubber	30	parts.
Barium sulphate	40	„
Rosin oil	15	„
Rosin or tar	15	„

The mixture is homogenised on rolls, then dissolve in a mixing machine.

White Petrolatum 60 „ „

SOFT SOAP

Linseed oil	25	lbs.
Groundnut oil	25	„
Rosin	5	„
Caustic potash lye 20°Be	50	„
Caustic soda lye 22°Be	14½	„
Potash carbonate	2½	„

Take the oils and rosin in an iron vessel and heat. When the temperature is about 100°C slowly run in the caustic potash lye with constant stirring. Add water small quantity at a time to make up the loss of water caused by evaporation. When the oils and lye are well-amalgamated add the pearlash dissolved in 5 lbs. of water so as to keep the mass thin. When the soap is clear and transparent, it is ready to be poured in suitable container.

BANSLOCHAN

257 A. A. J., Khulna—Wants particulars about banslochan.

Banskapur or banslochan is a siliceous and colloidal substance found in the inetrior of the hollow stems of most bamboos, chiefly *Bamtasa araundinacea*. This deposition is due to the disease set up by insects. There are two kinds of banslochan viz., kakudi (blue) and safid (white). It is largely used in medicine and is considered cooling, tonic, aphrodisiac and pectoral. It is an ingredient in many compound medicines which are given in different lung diseases, but from its chemical composition it must be quite inert.

ARTIFICIAL SLATE

258 A. B. G., Nowgong—Desires to know the process of manufacturing artificial slates.

Fine Sand	41	parts.
Lamp Black	4	„
Boiled Linseed Oil	5	„

Boil thoroughly together. Reduce the mixture by adding spirit of turpentine, so that it may be easily applied to a thin piece of wood. Give three coats, drying between each coat; finish by rubbing smooth with a piece of cotton waste soaked in spirit of turpentine.

RESIN PLASTER

278 G. K. S., Manbhum—Wants a recipe of resin plaster.

To prepare resin plaster, first prepare litharge plaster according to the following formula :—

Litharge, in very fine Powder	6	lbs.
Olive oil	1	gallon.
Water	1	quart.

Boil all the ingredients over a slow fire, constantly stirring to the consistence of a plaster, adding a little boiling water if nearly the whole of that used in the beginning has been consumed before the end of the process.

Now take this litharge plaster and proceed to make resin plaster in the following manner :—

Litharge plaster	72	lbs.
Olive oil	3	„
Pale yellow rosin	12	„

Melt the first two together in a bright and perfectly clean copper pan, and sift in the pale rosin, stirring all the while. Then allow the mixture to cool. Lastly pull or work in the usual way.

MERCERISING COTTON

301 G. C., Banaras—Desires to know a process of mercerising cotton.

Mercerising of cotton consists in impregnating the fibres with concentrated caustic soda lye, either with or without the application of tension, and in stretching the material before and during the removal of the soda by means of washing. Mercerisation on cotton can be carried out either in the loose state or in the woven condition. Boiling out is of course the first step, although in occasional instances, when dealing with certain qualities of cloth, it is not resorted to. Hanks are boiled out under low pressure, while warps are passed through a boiling out machine. Both forms of yarn are occasionally dried up after washing, before being brought into contact with the mercerising liquor.

The principles involved in the control of the mercerising both are the same for both yarns and cloths. They depend upon the temperature of the bath as well as upon its degree of concentration, and also upon the state of the material wet or dry. When employed at a strength from about 42°Tw. to 56°Tw., and used regularly and continuously at the same strength, the temperature of the bath should not be allowed to exceed 30°C. At low temperature the strength may be relatively

decreased within certain limits. Generally considered, that duration of contact of the alkali with the cotton is regarded only as a matter of secondary importance, excepting in certain system of treating pieces. when the contact is allowed to continue for many hours. For most purposes a treatment extending over two to five minutes is considered sufficient to give the maximum of results.

After treatment with caustic soda the first washing is an operation as important as any, and should be accomplished while the material is still under tension. After this souring and washing follow, especially if the goods are then finished and are required for dyeing with any other colours than the substantive and sulphide dyestuffs.

After washing, the cotton is dried still in the stretched condition, mercerised yarns show an appreciably better lustre than when dried in the loose state. A course of stringing on specially constructed machines is also occasionally resorted to.

GRINDING STONE

357 A. S. A., Delhi—Wants to know the process of making grinding stone.

— Emery stones are prepared with emery powder using magnesite as binding medium. The feature of this process is that the pulpy mixture of magnesium chloride solution, magnesite and emery powder is placed in metal moulds, which are mounted on a jig-table, the vibration of which causes the specifically heaviest portion of the mixture, viz., the grains of emery, to settle down gradually to the bottom of the mould as compactly as possible, each grain having time to assure the most suitable position with regard to its neighbours. The process gives an emery-stone consisting of 90 per cent. of emery and only 10 per cent. of magnesite binding medium, the superfluous portions of the latter being forced upward by the movement of the table, and then easily removed.

ABIR OR KUM KUM

411 P. B. R., Gorakhpur—Wishes to have a process of making abir.

The abir or red powder, used by the Hindus at the Holi festival is largely manufactured from the rhizome of Satti-plant (curcuma zedoria).

The principle of manufacture is as follows :—

The roots being dug up with the hoe, are thoroughly washed to remove all the adhering earth from their surfaces; they are then taken individually in the hand and deprived by a knife of every portion of their skins, while every unsound portion is cut away. This process must be performed with great care, otherwise the final product will be spoiled to a more or less extent. The skinned roots are thrown into a large cistern with a perforated bottom, and there exposed to the action of a copious cascade of pure water till this runs off quite unaltered. The cleansed roots are next put into the hopper of the mills, and are subjected to the pressure of two pairs of polished rollers of hard brass, the lower pair of rollers being set much close together than the upper. The starchy matter is thus ground into a pulp which falls into the receiver placed beneath, and is thence transferred to large fixed copper cylinders, tinned inside, and perforated at the bottom with numerous minute orifices. Within these cylinders wooden paddles are made to revolve mechanically with great velocity, at the same time that a stream of water is admitted into them from above. The paddlearms beat out the fecula from the fibres and the parenchyma of the pulp and discharge it in the form of a milk through the perforated bottom of the cylinder. This starchy water runs along pipes, and then through a strainer into large reservoirs, where after the fecula has subsided, the supernatant liquor is drawn off, and fresh water let on, the whole is agitated and left again to repose. The starchy material thus obtained is dried on trays in the sun and then the powder is mixed with a decoction of sappan wood and alum. It may also be coloured with some aniline dye.

ADHESIVE TAPE

249 A. N. B., Calcutta—Wishes to have a formula of adhesive tape.

Rosin	20	parts.
Rosin oil	30	„
Coal Tar	20	„
Wood Tar	10	„
Mineral oil	10	„
Linseed oil	10	„

Mix the ingredients over a moderate fire and treat the tape with the composition.

ARTIFICIAL IVORY

351 B. R. S., Itwari—Wants to know the process of making artificial ivory.

Mix 8 parts of shellac with 32 parts of ammonia solution of specific gravity 0.994, and shake into solution in revolving cylinders for about 5 hours. The result of the operation will be a complete solution of the consistency of thin syrup. Add to this 40 parts of zinc oxide, mix thoroughly with the

hand, and then grind the mixture in a colour-mill. The ammonia is then expelled by heating. The residue is completely dried upon glass plates, ground fine in a mill, and pressed into moulds with a pressure of as much as a ton to the square inch, and an increase of temperature to about 400°F. The product when taken from the mould, is of a pure white colour and closely resembles ivory.

ARTIFICIAL WOOD

229 B. A. D., Bombay—Desires to know a process of making artificial wood from saw dust and batching soap.

Many forms of artificial wood are formed by binding sawdust with ox-blood, starch, glue, flour, etc. and pressing. Several types of boards for building purposes were investigated to in England during the war. One of the most promising methods seems to be to give the saw dust a preliminary treatment with plaster of paris and then mix with cement. Such board must stand nailing.

Very fine boards can be made from 59 per cent. saw dust and sorel cement. They are cast on glass, and so have a smooth polished surface. Very pretty effects can be obtained by colouring the saw dust particles such boards should prove a good substitute for asbestos boards, and could also be used to replace plywood in furniture making, and especially in office fittings.

BATCHING SOAP

Batching soap is a kind of ammoniacal soap. It can be prepared by adding to hot oleic acid stronger ammonia water until the odour of ammonia remains perceptible and the mass assumes a translucent syrupy appearance.

BENZOATED OIL

420 L. W., Calcutta—Wants to know a method of making benzoated oil and bleaching gum.

To make benzoated oil say of almond oil, digest one ounce of powdered benzoin in a pint of almond oil for 3 hours on a water bath and filter through fine muslin. Oil thus prepared does not become rancid for a good length of time.

BLEACHING GUMS

Dissolve the gum in a small quantity of water and pass sulphurous acid gas through it for some time until all the colouring matter is destroyed and the gum is totally bleached. Now boil the liquid to expel the sulphurous acid, a little of which, however still remains behind. To obtain the gum in a still whiter state add carbonate of baryta and after agitating filter the mixture. Afterwards shake it with gelatinous alumina, again filter and evaporate. The product is very white but is deficient in certain percentage of the adhesive properties.

WHITE BOOT CREAM

364 B. R. K., Kurnool—Wants a good recipe of white boot cream.

(a)	Bleached wax	1	lb.
	Ceresin wax	6	oz.
(b)	Soft soap	11	,,
	Water	4	pints.
	Liquor Ammonia		q.s.

Melt the waxes together; and add the turpentine at a safe distance from the fire. Again dissolve the soap in water by gentle heat. Thoroughly mix (a) and (b) while still hot. Shake well until the whole mixture is well emulsified. Add more liquor ammonia to impart agreeable scent and bottle in suitable glass phials.

STERILIZING BRISTLE

559 A. C. A., Shillong—Wants to know the process of sterilizing bristles.

To sterilize bristles, put them in a steam chamber for 15 minutes and then slowly cool them by stopping the steam supply.

PREPARATION OF CAMPHOR

541 S. M. K. P., Shevapet—Desires to know the process of preparing camphor.

Camphor is generally obtained from a species of tree found chiefly in the island of Formosa. To extract camphor the wood is cut into small pieces and boiled with water in iron vessels, which are covered with large earthen domes, lined with rice-traw. As the water boils, the camphor is volatilised along with the steam and condenses in straw. The crude product is next purified. For this purpose 100 parts of crude camphor are mixed with 2 parts of each of quicklime and animal charcoal and the mixture is put in a glass vessel placed over a sand-bath. The heat is then continuously applied the camphor is sublimed off and deposited on the upper part of the vessel. When the process is complete, the vessel is removed and allowed to cool.

[illegible] PAPER

[illegible] D. G. T., Kumbakonam—Desires to know a couple of recipes of making carbon paper and process of refining castor oil.

I

Lampblack	10	parts.
Olive oil	10	,,
Ceresin wax	2	,,
Petroleum ether	20	,,

Rub the black and oil together in a mortar, adding the oil little by little, then put in a pan, and after heating it a little, add the wax. When this is melted and mixed, remove the pan from all fires and lights, and add the ether. Apply the mixture over the paper, and then place it to the oven for about 20 minutes, so that the mixture may thoroughly soak in. Take from the oven, and wipe off any moisture with a clean rag, then hang up to cool. Prussian blue may be added to the black to intensify it or to give a blue shade.

II

Castor oil	10	parts.
Lampblack	10	,,
Ceresine wax	2	,,
Petroleum ether	20	,,

Proceed as (I).

REFINING CASTOR OIL

The refining of crude castor oil consists mainly in the removal of the albumen, free fatty acids, colouring and odorous matters and is conducted by first coagulating the albuminous matter and mucilage by steaming and filtering, then bleaching and deodorising by agitation in the presence of animal charcoal, and finally filtering and drying. The bleaching of the solvent extracted castor oil has been found to be a difficult operation. The colouring matter is held in colloidal suspension and has probably become very firmly fixed during the heating operation. It is most resistant to the action of bleaching agent.

To clarify castor oil mix 100 parts of the oil at 95°F with a mixture of 1 part of alcohol (96 per cent.) and 1 part of sulphuric acid. Allow to settle for 24 hours and then carefully decant from the precipitate. Now wash with warm water, boiling for ½ hour, allow to settle for 24 hours in well closed vessels, after which time the purified oil may be taken off.

THINNER FOR CELLULOSE LACQUERS

413 H. S., Amritsar—Wants to have a recipe of thinner for cellulose lacquer.

Acetone	40	parts.
Ethyl acetate	10	,,

Mix in a stoppered bottle.

INK FOR WRITING ON CERAMICS

354 M. A., Nizamabad—Desires to know a formula of preparing ink for writing on ceramics.

A good ceramic ink can be prepared from :

Potassium carbonate	1	gram.
Borax	1	,,
Lead oxide	2	grams.
Cobalt nitrate	2	,,

Mix with raw linseed oil with possibly a little turpentine, apply with a pen and heat.

ARTISTS' TUBE COLOURS

The pigment and the oil should be of the finest quality, and the mixing and grinding must be of the most perfect description. The following list indicates some of the usual colours and the oil required by each.

parts.		parts linseed oil.
100	White lead	15
100	Zinc white	17
100	Chrome yellow	32
100	Yellow ochre	25
100	Raw sienna	180
100	Vermilion	20
100	Prussian blue	75
100	Ultramarine	37
100	Ram umber	100
100	Burnt umber	90
100	Burnt sienna	195
100	Bone black	110

COPAL VARNISH

460 H. N. K. V., Vaduvarpatti—Wants to have a formula of preparing copal varnish.

Dissolve 1 part of camphor in 12 parts of ether. When the camphor is completely dissolved, add 4 parts of colourless and finely powdered copal. Place this mixture in a bottle and shake until the copal is swollen and partly dissolved, then add 4 parts of proof alcohol and ½ part of rectified spirit or turpentine; shake again sufficiently, and the varnish is ready for use. After the bottle has stood for several days, however, the varnish divides into two distinct strata; the lower richer in copal, but the upper finer and perfectly colourless. The upper layer is claimed to be a good varnish. The lower stratum may be again treated with camphor, etc.

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

JOB HUNTING

46 J. K. B., Bhagalpur—I am a graduate and unemployed. As such, I am always on the lookout for employments advertised in the "Situations vacant" columns of newspapers. Very frequently, however, I find jobs carrying good salaries advertised under Box Numbers. requiring the applicants to deposit fairly substantial sume by way of security. Should I act wisely in so doing ?

Answer :—This is a very timely question, and we hope that every candidate who gets a job in response to his application to a "box number," on security deposit would consider the "pros and "cons" of the situation before accepting or rejecting such offer. This box number system, which enables an advertiser to conceal his identity from the public, at least in the first instance, does not seem to be unqualified blessing. The very first question which presents itself for solution in a case of this type is why should an individual or firm about to engage a man, seek to conceal his or its identity at all ? The only reasonable answer to this in favour of such individual or firm is that it is done with the object of avoiding the trouble and pestering which might otherwise be caused to the advertiser by troops of employment-seekers and job-hunters in response to the advertisement. But this might be easily avoided by the insertion of the words, "apply by letter only," in the advertisement. In cases of advertisements for posts requiring no cash security deposit, applications to "box numbers" need not raise any suspicion. But where security is asked for, the very fact of the advertiser seeking to conceal his identity under the evasive "box number" at once raises a presumption against the advertiser as to the bonafide of the whole thing. Very unpleasant results have often followed, culminating in police court trials, and leading to the discovery of the fact that in most cases the advertisers had obtained security deposits with the deliberate object of swindling the victims out of such sums. They had been paid just for a month or two, out of the amount advanced by them in the shape of security deposit, and then got rid of, somehow or other, by their unscrupulous employers. Most of the unfortunate persons thus dismissed or discharged are too timid or maladroit or poor to try to realise the amounts deposited by them by having recourse to law courts, with the result that quite a brisk trade is being plied by many designing scoundrels, under cover of anonimity, by depriving poor people of their security deposits in this way. From time to time, a villain or two is hunted down by the police, and convicted by magistrates, and the public then comes to hear of it from newspaper reports. For a week or so, perhaps there is some indignation in the minds of the readers, after which every thing is clean forgotten.

What then is the remedy ? We are of opinion that every newspaper should compel the advertiser to disclose his name and address, at the foot of the matter advertised, and this would put an end to much of this evil if not whole of it. Cheats and swindlers, as a class, prefer to work in the dark, and are unable to bear the limelight of public gaze focussed on them. They will, in the majority of instances, generally consider twice before issuing advertisements calling for security deposits from applicants—if they are compelled to publish their names and addresses with such advertisements. At the same time, it has to be admitted that much of the remedy lies in the hands of the applicants themselves, who must not as a rule agree to deposit any amount, however small, with a firm or individual regarding whose solvency, honesty and efficiency there is any rational doubt, and finally they would always do well in saving their postage and stationery by not applying for jobs in response to advertisements written in equivocal or ambiguous language.

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of Re. 1 stamps for each question. Subscribers outside India are requested to send eight International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

286 K. B. K., Alagappanagar—Plastic machines may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta. Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

287 D. R. S. D. H., Delhi—Following is a list of cigarette manufacturers: American Tobacco Corporation, Champa Gully, Bombay; Congress Golden Tobacco Co., Ghodbunder Road, Vile Parle, Bombay; Imperial Tobacco Co. of India Ltd., Virginia House, 37, Chowringhee, Calcutta; National Tobacco Co. of India Ltd., Agarpara, 24-pargs., Golcoonda Cigarette Factory, Munshirabad, Hyderabad; Hyderabad Deccan Cigarette Factory, Munshirabad, Hyderabad; Jubilee Cigarette Factory, Hyderabad and Tobacco Mfg. (India) Ltd., Bangalore.

289 K. B. B. S., Bareilly—For chemical plants enquire of R. J. Alcock & Co., P-12, Mission Row Extension, Calcutta, and Chemical Plant & Equipment Ltd., 7, Lower Chitpur Road, Calcutta.

290 S. B. E. S. C., Howrah—Sheet metal working machines may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta. Addresses of paint dealers, oil factories, oil dealers and others will be found in Industry eYar Book and Directory published from this office, price Rs. 17/- including postage.

291 A. C., Nellore—We do not deal in any article. We only supply information to our readers. Dyes may be had of Fuzle Hussein & Bros., 44, Armenian Street and Champalal Agarwala, 45, Armenian Street; both of Calcutta.

292 R. L. D., Calcutta—Following is a list of mineral merchants: Indian Mineral Supply Co., 31, Jackson Lane; India Chemico Mineral Industries, 14/2, Old China Bazar Street; Indian Mineral Industries Ltd., 22/1, Dum Dum Road and United Minerals Ltd., 2, Dalhousie Square East; all of Calcutta.

293 R. S., Cacutta—You require three roller machine for making waterproof. For roller machine enquire of Jessop & Co. Ltd., 93, Netaji Subhas Road, Calcutta and Francis Klein & Co. Ltd., 1. Royal Exchange Place, Calcutta.

294 J. R. S., Mattancheri—For removing outercoat of black pepper you have to use decorticating machine. For decorticating machine enquire of Marshall Sons & Co. (India) Ltd., 99, Netaji Subhas Road, Calcutta.

295 M. D., Barpeta—We have no book dealing with the manufacture of bricks and tiles. For the required book enquire of Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta. For machine write to Martin Burn Ltd., 12, Mission Row, Calcutta.

296 L. E. S., Calcutta—Following is the process of making liquid extract of bael: Bael 20 oz.; chloroform water 300 fl. oz.; chloroform 20 mins.; alcohol (90 p.c.) to produce 20 fl. oz. Bruise the bael and macerate for 12 hours with 100 fl. oz. of the chloroform water; pour off and reserve the clear liquid; repeat the maceration a second and a third time for one hour in each case, using for each maceration 100 fl. oz. of the chloroform water; press the mare and strain the mixed liquids through flannel. Evaporate to 15 fl. oz. cool add the chloroform dissolved in sufficient alcohol to produce the required volume, and filter. Dose 1 to 2 fl. dr.

297 K. C. S., Cuttack—Process of making mirror will be found in Independent Career for the Young. We have no other book dealing with manufacture of mirror. You may use hand machine. No power machine is required for spraying.

298 T. C. C., Ahmedabad—For scorpian bite cure write to Rajvaidya Narayanji Keshavji, 177, Harrison Road, Calcutta.

299 A. M., Nowgong—It is not possible to send diagram of power loom and calendering machine. You better consult a Mechanical Engineer.

300 R. L., Berhampur—*For cycle rickshaws enquire of the following firms* : Rickshaw Works, 13, Sura East Road; H. D. Nundy & Co., 50-6, Dharamtala Street and Pratap Singh, 256, Chittaranjan Avenue ; all of Calcutta.

301 G. C., Banaras—Process of mercerising yarn appears in this issue.

302 H. C. S., Bikaner—Manufacture of distemper cannot be carried on small scale. Formulas of dry distemper appeared in March 1951 issue of Industry.

304 T. S., Barbheta—Address of West Bengal Hosiery Industries is 41B, Brojodulal Street, Calcutta.

305 H. C. G., Puri—An article on pottery manufacture appeared in April 1952 issue of Industry. Black colour of the tile is due to presence of iron in the clay used for manufacturing tiles. You may also consult some book on tile manufacture. We have no book on tile manufacture. You may enquire of Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta for a book on tile manufacture.

307 D. S., Sylhet—For small oil extracting machine write to Oriental Machinery Supply Agency Ltd., P12, Mission Row Extension, Calcutta.

308 C. A., Jabalpur—Following is a formula of auto-valve grinding compound : Ceresine 5 parts; tallow 2 parts; oleic acid 20 parts; mineral oil 10 parts; carborundum finely powdered 53 parts. Melt the first four ingredients at 80° to 90°C. Then mix in the carborandum in small portions at a time. Stir until cooled to sufficient viscosity.

309 R. D. L., Bombay—Following is a formula of duplicator ink : Methyl violet 5 parts; diamond green 5 parts; dextrin 2 parts; gum arabic 2½ parts; hydrochloric acid 6 parts; carbolic acid ½ part; hot water 80 parts.. Dissolve the dextrine and gum arabic in the hot water. Then dissolve in it methyl violet and diamond green and add the hydrochloric acid. Lastly mix the carbolic acid, which acts as a preservative.

310 K. S. B., Dacca—You have to use emery grinding wheel for sharpening knives, razors, scissors etc. Emery wheels are prepared with emery powder using magnesite as binding agent. The feature of this process is that the pulpy mixture of magnesium chloride solution magnesite and emery powder is placed in metal moulds, which are mounted on a jig jig table, the vibration of which causes the spindle heaviest portions of the mixture viz., the grams of emery settle down gradually to the bottom of the mould as compactly as possible each grain having time to assume the most suitable position with regard to its neighbours This process gives an emery wheel consisting of 90 per cent emery and only 10 per cent magnesite binding medium, the superfluous portion of the latter being forced upward by the five pin movement of the table and then easily removed.

311 M. P. E., Unjha—Match making machines may be had of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension; Harima Engineering Works, 63 Belgachia Road, and Standard Machinery Co., 67B, Netaji Subhas Road; all of Calcutta.

312 P. N. N., Shivpuri—Tabasir or banslochan is a siliceous and colloidal substance found in the interior of the hollow stems of most bamboos chiefly Bamtasa araundinacea. This deposition is due to the disease set up by insects. These are two kinds of tabasir, viz., kalendi (blue) and safid (white). It is largely used in medicine and is considered cooling, tonic, aphrodisiac and pectoral. It is an ingredient in many compound medicines which are given in different lung disease but from its chemical composition it must be quite inert.

313 B. V. V. N. D., Ellore—Following is a list of bristle merchants : Indian Bristles & Lard Supply Co., 31-1, Tangra Road, Calcutta; Khaitan Sons & Co., 2, Dalhousie Square East, Calcutta; S. Mazumdar, 67B, Netaji Subhas Road. Calcutta; Cowasjee & Sons, Opp. Anwarganj, Kanpur; H. & S. Bros., 105, Kalpi Road, Kanpur and Hind Bristle Co., Mulbery House, Agra. To sell bristles, you may negotiate with the above firms.

314 B. L. P., Uttarpara—Address of Kusum Products Ltd., is Bombay Mutual Bldgs., 9, Brabourne Road, Calcutta-1.

315 M. R. P., Calcutta—Following is a list of coir manufacturers : Alleppey Co. Ltd., Alleppey, Travancore; Bombay Company Ltd., Pollock House, Pollock Street. Calcutta; C. A. Abdul Wahab & Co., Jew Town, Mattancheri, Cochin; Eastern Produce Co. Ltd., Alleppey, Travancore.

316 F. T. C., Jharia—The method of the manufacture of different syrup powder is identical with the exception of the flavour and colour. Powdered citric acid 1 oz.; powdered refined sugar 15 oz. To make the flavoured powders, proceed as follows : —Put about 4 oz. of the powder into a mortar and spray or drop the mixed flavouring materials over it sowly mixing well. When all have been added, gradually add the remainder of the acid, mixing well after each addition. The colour should be

dissolved in the flavouring mixture before adding the acid. When well mixed place in a glass dish and stir often until it has dried out sufficiently to admit of packing. Next put up in glass bottles with closely fitting stoppers, but may be put up in cans.

317 R. R., Bankura—For spare parts of motors enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

318 P. N. G., Jorhat—Chalk pencil manufacture may be started on small scale. Process of manufacturing will be found in Prospective Industries published from this office, price Rs. 3/12/- including postage. Chalk pencil making machine may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta. You may start the business with an initial capital of Rs. 1000. But you have to invest more money with the expansion of the business. Following is a list of chalk pencil manufacturers: Colorpen Co., 6, Sashi Soor Lane, Calcutta; Golden Industry, 33, Ellaki Chetty Street No. 11 Kumbakonam; Indian Crayon Works, Ahmednagar; M. L. Chatterjee & Sons, 4, Commercial Bldg., Calcutta; Modern Chalk Pencil Co., Gujranwala and Radha Krishna Chalk Works, Nuzvid, Kistna.

319 P. K., Meerut—Pill and tablet making machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

320 S., Kolhapur—Bleached shellac may be had of Angelo Bros. Ltd., 6, Lyons Range, Calcutta and A. M. Arathoon Ltd., 11, Stephen House, Dalhouse Square, Calcutta.

321 K. S. L., Nairobi—For sending reply by air mails you have to send airmail postage charges in addition to the usual charge of Re. 1/- per question.

322 M. P. I., Amritsar—We have not received your previous letter along with the sample of bead.

323 S. P. C., Salem—Following is a formula of insulating tape: Carnauba or montain wax 40 parts; rosin 32 parts; castor oil 15 parts; carbon black 8 parts. Melt the wax and rosin and then add the castor oil. Lastly thoroughly incorporate the carbon black while the mixture is still hot treat the tape by simply dipping for a few seconds.

324 J. S. P., Rajkot—Camphor is generally obtained from a species of tree found chiefly in the island of Formosa. To extract camphor the wood is cut into small pieces and boiled with water in iron vessels which are covered with large earthen domes, lined with rice-straw. As the water boils, the camphor is volatilised along with the steam and condenses in straw. The crude product is next purified. For this purpose 100 parts of crude camphor are mixed with 2 parts of each of quicklime and animal charcoal and the mixture is put in a glass vessel placed over a sand bath. The heat is then continuously applied, the camphor is sublimed off and deposited on the upper part of the vessel. When the process is complete, the vessel is removed and allowed to cool.

325 I. O. T., Calcutta—In order to prepare thymol from ajowan seeds take a stout distilling vessel of cast iron fitted with a condenser and receiver. A fairly large quantity of ajowan is put into the vessel according to its capacity and a quantity of water is then poured to cover the seeds just immersed in it. On heating the oil of thyme is distilled over. It is condensed and collected in a receptacle placed in the other end of the condenser. The oil is then separated from water by decanting the upper layer. Thymol is isolated from this volatile oil by shaking the latter with an equal volume of warm sodium hydroxide (sp. gr. 1.33) and after several hours the mixture is diluted with 2-3 volumes of hot water. The aqueous portion which contains the thymol in solution in the form of its sodium salt is separated and acidified. The precipitated thymol is dried and rectified by distillation. The fraction which distils at 220°-235°C. is seeded with a crystal of pure thymol and set aside in a cold place. The crystallised thymol is separated by filtration and purified by recrystallisation from petrol.

326 P. S., Tuticorin—For supplying duck eggs you may negotiate with the following firms: A. K. De, Hyat Khan Lane and Gandheswari Bhandar, 3, Hyat Khan Lane; both of Calcutta. For selling senna leaves and other crude drugs and herbs you may negotiate with Banshidhar Dutt, 126, Khengrapatty Street and Indian Herb Stores, 31, Mullick Street; both of Calcutta.

327 S. T. H., Gujranwala—For obtaining degree in homeopathy write to Homeopathic University, Sialkot City; Homeopathic Jyan Niketan, 23/4, Hardwar Road, Dehra Dun; Bengal College of Physicians, 39, Neogipukur Lane, Calcutta and International Institute, Aligarh.

328 D. C., Jammu Tawi—For coconut oil write to Adam Hajee Peer Mohamed Essack, 1, Amratola Lane; Dian Haji Pirmohamed Musa, 4, Amratolla Street and Shakur Haji Gani, 10, Amratolla Lane; all of Calcutta. Following is a list of varnish

manufacturers : Bassein Paint & Varnish Co., A Tulsiram Mills Estate, Mazagaon, Bombay; Calcutta Paint Colour & Varnish Works, 8, *Chunapukur Lane, Calcutta*; Ruby Paint & Varnish Works, 168, Jessore Road, Calcutta; Royal Enamel & Varnish Works, 78-79, Beadon Street, Calcutta and Standard Paint Works Ltd., 44, Beadon Row, Calcutta.

329 H. C. S. W., Cherrapunji—Ripe nuts are suitable for supari. In some cases the shelled nuts are boiled, in other not; the varieties of the nut met with in trade are numerous. The first class includes different varieties of ripe betel-nut produced by cultivation which have not undergone any preparation; the second class, all nuts ripe or unripe, which have been treated by boiling or other process before being offered for sale. After preparation the nuts are graded according to size. The nuts should be dried whole. The first class whole nuts fetch good price in the market. For selling supari you may negotiate with Banshidhar Dutt, 126, Khengraputty Street, Calcutta.

330 K. L. C., Agra—We have no book dealing with repairing of typewriter machine and sewing machine.

331 D. N. M., Nagarikatakam—For building construction you may negotiate with Associate Engineers & Co., 138, Canning Street, Calcutta; Bombay & Co. Ltd., "Pollock House," Pollock Street, Calcutta; Vikrama Engineering Co., Lallice Bridge Road, Adyar, Madras-20; King & Co., 321, Thambu Chetty Street, Madras-1 and National Engineering Co., 103, Nagdevi Street, Bombay. For cement floors and stone slabs write to Concrete Construction Co., 29, Waterloo Street, Calcutta; A. B. C. Floors, 13, Dalhousie Square, Calcutta; Central India Stone Co., 503-500, Duncan Road, Null Bazar, Bombay and P. N. Mehta & Co., 156, Radha Bazar Street, Calcutta.

331(a) P. O. S., Dinajpur—The preservation of syrup as well as of all sugar solutions is best promoted by keeping them in a moderate cool but not a very cold place. Hence to ensure preservation of the syrup the usual practice with the manufacturers is to keep it in vessels well-closed and in a situation where temperature never rises high. They are kept better in small than in large vessels; for the longer a bottle lasts the more frequently will it be exposed to air. By bottling syrups while hot and immediately corking up and tying the bottle over with a bladder perfectly air-tight they may be preserved at a summer heat for years without fermenting or losing their transparency.

332 L. L. B. R., Calcutta—Following is a recipe of gripe cure : Spirit ammon co 3 dr.; potash bicarbonate 1 oz. 3 dr.; simple syrup 32 oz.; aqua caraway concentrated 1 oz.; aqua anise concentrated 1 oz.; aqua anethi concentrated 2 oz.; distilled water 4 pints 4 oz. Dissolve all the ingredients one by one. Dose : For an infant, half a tea-spoonful; two months old, one or two tea-spoonfuls. These doses may be gradually increased.

333 C. R. D., Madras—Perfumed cards are often used for advertising purposes and are better perfumed before printing. For this purpose the card in sheets is placed in a specially constructed chamber and the perfume volatilised at a low temperature from a shallow tray in the bottom. This method yields uniform results and is better than immersion, when the sheets are apt to crinkle or come out in streaks. The perfume chosen is generally the one being advertised when it should be prepared for the purpose in concentrated form. An example of lavender perfume is given : Lavender oil (English) 50 parts; Lavender oil (French) 150 parts; bergamot oil 250 parts; thyme oil 20 parts; rosemary oil 30 parts; Oakmoss absolute 20 parts; patchouli oil 30 parts; musk ambrette 25 parts; coumarin 25 parts; tincture of benzoin 10 per cent 450 parts.

334 R. P. A. D., Gauhati—Following is a formula of crushed pine apple fruit syrup : Crushed pineapple 30 lbs.; cane sugar 5 lbs; sodium benzoate 18 gr.; powdered pectin 3 oz.; distilled water 1 gal. Mix the powdered pectin with 5 lbs. of sugar. Add this to the boiling water, while stirring, then add balance of the sugar and cook to 220°F. Now add crushed pineapple and cook to 225°F. Shut off steam and add the sodium benzoate previously dissolved in 5 oz. of water. Stir around and then transfer immediately to the cooling table.

335 G. R. R., Khargpur—Umbrella materials may be had of Gambhir Chand Rathi, 39, Armenian Street; Rup Metal Industries, 6, Karbala Md. Street and Sohan Mohanlal Ltd., 14/2, Old Chinabazar Street; all of Calcutta. Umbrella cloth may be had of Empress Mill, Nagpur and Central India Spg. Wvg. Mfg. Co. Ltd., Nagpur.

336 P. P. P., Mansa—Pill making machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta-4. You may consult Kelly's World Directory to be had of Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta. You better consult a physician for a medicine of birth control. You should register the name of your firm.

337 M. O. B., Bezwada—Following is a recipe of jet black ink for fountain pen : Nigrosine water soluble 3 oz.; blue aniline 4 dr., orange aniline 2 dr.; dextrine 1 oz.; rectified spirit 2 oz.; distilled water, hot 1 gallon. Mix, cool and filter. Colours may be had of Fuzle Hussein & Bros., 44, Armenian Street, Calcutta. Dextrine may be had of Calcutta Chemical Co. Ltd.. 10, Bonfield Lane, Calcutta. Inkpots may be had of Bimal Bottle Stores, 130, Radha Bazar Street and Satya Charan Paul, 194. Old China Bazar Street; both of Calcutta. Cardboard boxes may be had of S. Antool & Co. Ltd., 91, Upper Circular Road and Universal Cardboard Box Factory, 54, Ezra Street; both of Calcutta.

338 P. K. R., Bombay—Photo materials may be had of Ama Ltd.. Canada Bldg., Fort, Bombay; Bombay Camera Co., 393, Surya Niketan, Girgaum Road, Bombay-2; Camera House, 131, Girgaum Road, Bombay and Popular Camera Co., Nawab Bldg., 327, Hornby Road, Bombay.

339 V. R., Tanjore—For Cameras enquire of Chowringhee Camera Stores, 10, Chowringhee Road, Calcutta-13; City Camera Stores, 38, Dharamtala Street. Calcutta; Photographic Stores & Agency Co. Ltd., 154, Dharamtala Street, Calcutta and New Market Photographic Stores, 44-1, Chowringhee Place, Calcutta.

341 M. S. K., Ambala Cantt.—Following is a list of casein manufacturers ; Bullion Dairy Farm, 176. Shroff Bazar, Bombay-2; Casein Trading Co., Anand ; Khadi Pratisthan, 15, College Square, Calcutta; Khaitan Sons & Co., 2, Dalhousie Square East, Calcutta; Polson Ltd., 65B, Dock Yard Road, Mazagaon, Bombay-10 and Western Creameries, Nadiad. You will require cream separator and churning machine which may be had of Edward Keventers Ltd., 11/3, Lindsay Street, Calcutta.

342 G. N. P., Nipani—Pharmaceutical Preparation is out of print.

343 D. S. F., Monghyr—Plastic machines may be had of Francis Klein & Co. Ltd., 1. Royal Exchange Place and Alfred Herbert (India) Ltd., 13/3, Strand Road; both of Calcutta. Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta. Process of manufacturing all kinds of soaps including toilet will be found in Manufacture of Soap published from this office, price Rs. 4/12/- including postage. Soap making machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta. Both plastic and soap industries have good prospect.

344 J. G. S., Calcutta—Following is a formula of chalk crayons : Plaster of Paris 50 parts; precipitated chalk 50 parts; water sufficient to make soft mass. Mix the plaster with the chalk and sufficient water to make mass. Then pour into gun metal moulds oiled. Allow the mass to set and then take out. Raw materials may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta. Mould may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

346 V. H. I., Berhampur—Match sticks and match boxes are supplied by match manufacturers so we supplied you a list of match manufacturers. You may communicate with match factories for match sticks and match boxes. There are no other dealers of match sticks and match boxes. Match chemicals may be of Allied Agency, 16, Bonfield Lane, Calcutta.

347 M. R., Agra—For books and magazines enquire of International Book House Ltd., Ash Lane, Opp. Clock Tower, Fort, Bombay; Pioneer Book Depot, 181-3, Hornby Road, Fort, Bombay; W. Newman & Co. Ltd., 3, Old Court House Street, Calcutta and Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta.

349 K. C. E., Cochin—For supplying oxide of zinc communicate with the following firms : Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta; Allied Agency, 16, Bonfield Lane, Calcutta.

351 A. I. T. C., Baroda—We sell only our own publications. For foreign books enquire of Thacker Spink & Co. Ltd., 3, Esplanade East and W. Newman & Co. Ltd., 3, Old Court House Street; both of Calcutta.

353 L. L. B., Indore—Grinding wheels and the abrasive articles are made with latex as the binder for the abrasive materials : Carborundum grains 300 parts; rubber (from latex) 100 parts; sulphur 20 parts; accelerator 2 parts. Cure 2 hours at 287°F. To the latex mix made from this formula is added a polution of zinc acetate or other coagulant. the mass being stirred until it has a cheese-like consistency. It is then moulded to shape, dried and vulcanized to the hard rubber stage. Emery cloth or paper can be made from the formula shown to which glue or casein is added to make the binder more adhesive. It is then spread on fabric or paper, dried and vulcanised in dry heat.

354 H. A. S., Boko—Tari is not available for sale in bottle.

355 B. D., Allahabad—Following is a formula of depilatory cream : Barium sulphide 30 grams; atropine 5 grms; sper-

maceti 100 grm; distilled water 200 grms; white petrolatum 300 grms. Melt over a water bath and mix and put in pots. This cream can be used as depilatory or can be applied every day for 20 minutes to stop the growth of unwanted hair.

356 K. S. R., Madurai—Wants to be put in touch with the suppliers of fibre sheets.

357 A. S. A., Delhi—Process of manufacturing grinding stone will appear in due course.

358 G. A. M. A. P., Jhansi—Particulars of film anster are not available. For small filtering machine enquire of Adair Dutt & Co., Ltd., Stephen House, 5, Dalhousie Square East, Calcutta and S. V. Sovani, 239, Girgaon Road, Bombay-14.

359 G. R. S., Bombay—Following is a list of wool merchants: Vasanji & Co., 36-42, 2nd Janjrapole Lane, Bombay; Karim Bux & Elahi Bux Bros., 58-3, Canning Street, Calcutta; Tilak Raj Jain & Bros., Jammu Tawi; Sunderdas Narsoomal, Forbes Bldg., Home Street, Bombay; Usman Jusab Unwala, Munsar Road, Viramgam, Ahmedabad; Seth Kundanmalji Lalchandji, Beawar; Gopi Kissen Ratan Lal, 39, Armenian Street, Calcutta; Hamirmal Dall Chand, Mewari Bazar, Beawar and Kishore Chandra & Co., 115, Vithalbhai Patel Road, Girgaum Back Road, Bombay.

360 R. K. D. I., Ganjam—Following is a recipe of pan masala: Coriander seed 1½ tola; aniseed 1½ tola; parsley 1 tola; nutmeg 1 tola; ajowan 1½ tola; saffron ½ tola; seeds of cardamom major 1½ tola; seeds of cardamon minor 1½ tola; cloves ½ tola; dry rose petal 1 tola; chua 1½ tola; camphor 1½ tola. Take all the ingredients except the last two and soak them in good rose water for 12 hours. Then bray them together to paste form and incorporate chua and camphor. Following is a formula of enamel paints: The enamel paints can be made by mixing varnish and pigments. The oil varnish is heated and reduced to about 25 to 35 per cent by the evaporation of spirit, and the colours are added while the varnish is hot. For a white paint either white lead, zinc white or barium sulphate are used with larger quantities of turpentine and some china clay if a matt surface is required. Driers are also added, manganese borate being a favourite substance. The following formula is generally recommended: Zinc white 15 lbs.; white lead 8 lbs.; oil varnish 1¾ gallons; oil of turpentine 1¾ gallon; rosin 3 lbs.; blue a trace; manganese borate or calcined zinc sulphate 4 to 10 oz.

361 D. C. S., Ajmer—You have to advertise widely for selling cardboard slates manufactured by you. You may also send samples of slates to primary schools with circular letters.

362 B. D. R., Calcutta—Following is a formula of blanco: Whiting 74 parts; glue 1 part; water 25 parts. The water is warmed to about 176°F and powdered glue is stirred in until dissolved. The whiting is then added slowly with constant stirring after the source of heat has been removed and to each 100 lbs. of mixture 8 oz. of sodium salicylate are added to prevent decay of glue during subsequent storage. When the paste is smooth and uniform it is placed in warm moulds and after cooling the cakes are removed and packed. Following is a formula of flint for cigarette lighter. The flints are cylindrical in shape and contain a large portion of cerium. Alloys of cerium with either 30 per cent iron or 12 per cent magnesium are made. Put cerium metal 88 parts with magnesium 12 parts or cerium 70 parts with iron 30 parts in a crucible and melt these by means of strong heat. Now pour these alloys to suitablbe moulds.

363 D. C. W., Raniganj—Perfumery raw materials may be had of A. K. Sirkar, 130, Radha Bazar Street, Calcutta; F. N. Sarkar, 37, Canning Street, Calcutta; Clive Medical Hall, 8, Ezra Street, Calcutta; Ghose Brothers, 50, Ezra Street, Calcutta and Hindusthan Aromatics Co., Naini, Allahabad.

364 S. A. V., Nanded—You may earn Rs. 250/- per month by investing Rs. 5,000/- in sewing thread manufacture.

365 H. P. D., Shillong—You have to invest at least Rs. 1 lakh for starting a glass factory. As regards hurricane lantern manufacture you have to invest more. Both the industries are profitable. You should consult experts for detailed information about the above industries. We have no book dealing with glass manufacture and hurricane lantern manufacture.

366 S. V., Bangalore—For razor blades you may enquire of National Razors & Blades Ltd., 4, Dalhousie Square and Harbanslall Malhotra, 11, Netaji Subhas Road; both of Calcutta.

Factory Reports

Sterling Laboratory owned by Messrs. Banerjee & Son, 12, Pathuriaghata Street, Calcutta, manufacture mustard which is not inferior to any kind of similar imported staff.

EXPORT OF ONIONS : ALLOTMENT OF QUOTAS TO NON-ESTABLISHED SHIPPERS

The *following Notice (No. G-263/53, dated the 13th October 1943)* has been issued by *the Joint Chief Controller of* Imports and Exports, Calcutta :—

It is hereby notified for information of the trade that against the quotas of Onions reserved for distribution to non-established shippers, applications are invited from those who fall under any one of the following categories :—

(a) Shippers who exported Onions to destinations other than Pakistan and Foreign Possessions in India during any of the three financial years, 1945 to 1947-48.

(b) Shippers who have got their basic year exports but failed to receive allotments during the last half year for the reasons that they did not file their claims for enlistment as established shippers before the prescribed date.

(c) Internal dealers who received quotas of Onions as newcomers during July-December 1952.

2. (*i*) Shippers falling under the Category (a) above should submit statement showing their past exports of Onions 1945-46 to 1947-48, and the shippers falling under Category (b) should also submit statements showing their basic year exports of Onions to destinations other than Pakistan during any of the four financial years, 1948-49 to 1951-52. Statements in both the cases should be supported by relative Bills of Lading and export invoices.

(*ii*) Internal dealers should submit statements showing their actual exports of Onions against the quotas granted to them as newcomers during July-December 1952. The statements should also be accompanied by relative Bills of Lading and export invoices.

3. No person should apply under more than one category mentioned in para, 1 above.

4. Firms who have received quotas as established shippers for July-December 1953 will not be eligible to apply against this quota.

5. All applicants cannot be guaranteed any minimum allotment. In view of the *limited quota available, applicants whose performance is comparatively poor may have to be eliminated.*

6. Applications in the prescribed form quoting therein the current Income-tax Verification Certificate Registration or Exemption Number, as the case may be, supported by requisite Treasury Receipt along with the statements and other documents should be submitted to this office on or before 7th November 1953 will not be entertained.

EXPORT OF COTTON WASTE BLANKETS

The following Trade Notice (No. G/265/53, dated on 20th October 1953) has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

In amplification of this Office Notice No. G/230/53, dated the 21st September 1953, on the above subject, it is hereby notified for the information of the trade that—

(*i*) licences for export of cotton waste blankets originally validated upto 31st December 1953, in accordance with this office Notice No. G/159/53, dated the 14th July 1953, will be revalidated till the 30th June 1954 for shipment of cotton waste blankets packed not only during October to December 1953, but also packed in subsequent months upto the end of June 1954, and

(*ii*) fresh licences that are taken out in in accordance with this Office Notice No. G/230/53, dated the 21st September 1953, will be made valid upto the 30th June 1954 for shipment of cotton waste blankets packed during the period October 1953 to June 1954.

Provided the packing restrictions envisaged in the Textile Commissioner's Notification No. T. C. (26)/2/52, dated the 10th September 1953, are complied with, so long as these restrictions remain in force.

Tender Notices

SUPPLY OF CATTLE WEIGHBRIDGE

Office of Issue :—The Directorate General of Supplies and Disposals (Railway Stores Directorate), Shahjahanpur Road, New Delhi.

Tender No. P/SW3/3241-D/III.

Due by 10 a.m. on the 25th November 1953.

Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Avery No. 411°CFJ or similar dial indicating Weighbridge, 3,000 lbs. and 1,500 Kilos capacity with chart graduated 10 lbs. and 5 Kilos divisions.	1 No.
	Price per tender set ..	Rs. 3-0-0

SUPPLY OF ROLLER PAN MIXER

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SPI (A)/18261-D/11.

Due by 10 a.m. on the 16th November 1953.

Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Petrol Driven Roller Pan Mixer of 8 to 10 cubic feet capacity	1 No.
	Price per tender set ..	Rs. 5-0-0

SUPPLY OF STEAM PUMP

Office of Issue :—The Directorate General of Supplies and Disposals, Shahjahan Road, New Delhi.

Tender No. SPI/18263-D/I/RP/53.

Due by 10 a.m. on the 27th November 1953.

Sealed tenders are invited for—

	Description of Stores		*Quantity.*
1.	Steam Pump Size 6″×4″×6″		10 Nos.
	Max. Work Pressure	160	lbs. per sq. inch.
	Max. Steam Pressure	100	lbs.
	Normal Capacity	3,060	gls. per hour.
	Steam Pump Size 12″×8½″×12″		1 No.
	Description of Stores.		*Quantity.*
	Max. Working Pressure	160	lbs. per sq. inch.
	Max. Steam Pressure	100	lbs. per sq. inch.
	Normal Capacity	20,700	gls. per hour.
3.	Steam Pump Size 10″×6″×10″		11 Nos.
	Max. Working Pressure	160	lbs. per sq. inch.
	Max. Steam Pressure	160	lbs.
	Normal Capacity	9,480	gls. per hour.

SUPPLY OF STEAM PUMP

Office of Issue :—The Directorate General of Supplies and Disposals, Shahjahanpur Road, New Delhi.

Tender No. SP.1/8010-D/1/RP/53.

Sealed tenders are invited for—

Joseph Evans Reliable Fly Wheel Double Acting Steam Pump 7″×4″×9″ stroke or similar 3260 G. P. H.—Height of discharge 240 ft.	4 Nos.
Price per tender set	Rs. 5-0-0

SUPPLY OF TAPS AND ANVILS FOR "MASSEY" HAMMERS

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SWI/17960-D/1.

Due by 10 a.m. on the 26th November 1953.

Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
	Taps and Anvils for "Massey" Hammers.	
1.	Tap Pallett for 7 cwt. Hammer	11 Nos.
2.	Anvil Pallett for 7 cwt. Hammer	11 „
3.	Tap Pallett for 10 cwt. Hammer	4 „
4.	Anvil Pallett for 10 cwt. Hammer	4 „
5.	Tap Pallett for 20 cwt. Hammer	2 „
6.	Anvil Pallett for 20 cwt. Hammer	2 „
7.	Tap Pallett for 30 cwt. Hammer	2 „
8.	Anvil Pallett for 30 cwt. Hammer	2 „
	Price per tender set	Rs. 6-8-0

INDUSTRIAL PRODUCTION

Industries		1952	Jan., to May, 1952	Jan., to May, 1953*	April, 1953*	May, 1953*	May, 1952
Major Industries.							
l	lakh tons	362.22	158.3	156.87	32.44	31.96	31.74
il	lakh tons	15.78	5.3	6.57	1.23	1.25	1.23
n	million lbs.	1,448.36	571.0	608.7	122.0	124.0	116.5
h	million yds.	4,603.20	1,790.8	2,035.4	419.0	423.0	391.0
ent	lakh tons	35.37	14.00	14.65	2.85	3.24	2.84
er	tons	1,37,504	57,002	56,322	11,699	11,013	10,910
ches	cases	6,08,200	2,50,500	2,62,000	51,500	52,500	52,300
ar	lakh tons	14.19	10.60	10.57	1.54	0.34	0.90
ngineering and Electric Industries.							
hine tools	value in lakhs of Rs.	44.37	18.76	16.55	3.42	3.32	5.41
tric lamps	lakhs	208.81	85.12	81.46	15.07	15.23	16.81
cells	crore Nos.	13.02	5.53	5.44	1.20	1.13	0.73
nsformers	k.v.a.	2,14,800	83,100	1,20,900	28,200	24,500	16,200
ors	h.p.	1,57,600	68,400	72,600	15,700	13,300	12,400
tric fans	Nos.	1,95,500	91,300	78,700	18,600	18,600	20,100
io receivers	Nos.	71,495	29,304	24,441	4,738	5,230	4,930
age battery	Nos.	1,58,400	80,400	63,200	14,900	16,600	12,000
es and wires—							
pper conductors	tons	5,928	1,376	4,060	958	949	450
inding wires	tons	398	209	133	10	10	49
ibber insulated cables and flexibles	lakh yds.	328.6	137.30	197.5	45.3	49.0	23.6
lators—							
T.	Nos.	3,25,000	1,59,500	1,26,400	1,800	42,100	10,500
T.	lakh Nos.	30.50	14.13	9.85	2.20	2.21	2.53
Chemical Industries.							
	lakh mds.	768.64	455.94	565.53	180.16	229.18	173.66
tic soda	tons	17,058	6,871	7,547	1,530	1,553	1,148
ash	tons	44,322	14,129	20,207	1,710	4,787	1,160
rine liquid	tons	6,240	2,380	2,853	551	598	440
ching powder	tons	792	377	502	122	136	48
romates	tons	1,463	656	912	215	149	87
huric acid	tons	96,081	33,942	38,359	7,203	7,500	8,802
rphosphates	tons	46,650	18,239	11,879	3,170	2,960	5,037
Non—ferrous Metals—							
ninium	tons	3,566	1,729	1,403	200	306	322
mony	tons	181	108	35	—	15	—
er	tons	6,079	2,720	875	—	—	610
	tons	1,132	484	624	70	200	87
Miscellaneous (Minor) Industries.							
ng machines	Nos.	50,045	21,804	24,412	4,930	4,540	4,472
icane lanterns	lakh Nos.	35.23	14.40	16.19	3.48	3.35	2.71
cles	Nos.	1,96,956	56,703	77,374	15,687	18,507	14,536
tyres and tubes	lakh Nos.	83.55	31.75	35.28	6.46	7.99	4.09
r tyres and tubes	lakh Nos.	13.83	6.56	5.39	1.17	1.27	1.03
ettes	crore Nos.	2,058.85	890.33	840.24	155.08	201.20	149.43
ood—							
chests	lakh sq. ft.	782.27	340.85	290.29	45.98	60.00	91.34
nmercial	lakh sq. ft.	122.58	45.73	60.18	11.97	10.00	10.92
ctories	lakh tons	2.43	1.05	0.95	0.19	0.18	0.21
sives	reams	55,000	16,200	24,600	6,500	5,000	4,000
glass	lakh sq. ft.	90.42	48.9	123.74	25.34	25.34	—
len manufactures	lakh lbs.	166.68	56.15	63.47	13.47	13.43	10.58
vear—							
stern type	lakh pairs	33.67	14.38	14.40	3.13	3.06	2.02
ligenous type	lakh pairs	18.06	8.48	8.50	1.64	1.67	1.61
hol—							
lustrial	lakh galls.	38.45	29.82	22.14	4.18	5.07	6.07
wer	lakh galls.	77.42	35.72	36.07	6.90	8.41	6.07

Figures are subject to revision month to month. * Provisional.

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How we mix oil and water ..for better lubrication !

The cylinder of a steam engine is a tough lubrication problem. The reason is that some of the steam nearly always condenses on the cylinder walls, washing off the lubricating oil, and increasing the risk of wear.

The washed-off oil could, perhaps, be replaced by increasing the oil supply to the cylinder. However, this would greatly increase the consumption of oil. Worse still, in a condensing engine the exhaust steam returns to the boiler as feed water; and if too much oil is fed to the cylinder, it may contaminate the feed water and cause boiler failure.

Experience finds the answer

As usual, the makers of Gargoyle Steam Cylinder Oils have an answer to the problem. To resist the washing effect of the condensing steam, they force it to *combine* with the oil in an emulsion.

Thanks to careful control in manufacture, this emulsion has *greater adhesiveness* and film strength, to give full continuous lubrication. Moreover, the oil supply to the cylinder can be considerably reduced; so much so, that the exhaust and feed water may actually be contaminated *less* than by a non-emulsifying oil.

Yes, it's simple enough – in principle. But as any engineer knows, principles aren't everything; you need *experience* to carry them out. We have 87 years of experience like this; perhaps we can put it to work on your lubrication problem!

A special kind of emulsion

Gargoyle Steam Cylinder Oils form an emulsion of a special kind – a *water-in-oil* emulsion. This means that the water is broken up into tiny droplets, each imprisoned in a bubble-like film of oil.

This type of emulsion gives efficient lubrication. It can establish a strong bond with metal, and provides a protective film that resists the washing effect of moisture.

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Reduced power consumption;
More continuous production;

Decreased maintenance;
Lower lubrication costs.

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A Monthly Magazine for Manufacturers and Businessmen.

Editor: K. N. BANERJEE.

Published in the first week of the month by

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CONTENTS FOR SEPTEMBER - OCTOBER, 1953

Contents for NOVEMBER - DECEMBER ISSUE

November-December issue of Industry will contain useful articles an industrial and technical subjects such as Cotton Printing and Discharging; Preparation of Honeyed Candies; Sandblasting Practice; Etching Copper; Recent Development in Textile Finish; Raw Material for Paper; Tapping of Papaya for Papain; Bee-keeping as a Cottage Industry; Sports Goods Industry in India in addition to the regular features such as Agricultural Tips; Scientific Researches and Invention; Engineering Notes; The Business World; Official India; Pharmaceutical Recipes; Formulas, Processes and Answers; Reader's Business Problems; and Queries and Replies.

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All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

All enquiries regarding the Subscription or Advertisement Departments should be addressed to the General Manager.

OFFICE HOURS.

Editorial Department	11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays
Subscription and Advertisement Department	10 A.M. to 5 P.M. on weekdays and 10 A.M. to 2 P.M. on Saturdays.

RELIEF TO COTTON MILLS

Some time ago the Government announced certain reliefs for the Indian cotton textile industry. The concessions have met with a mixed reception and the textile circles take the view that they do not go far enough in as much as the Government chose to do nothing knowing fully well that the plight of the cotton textile industry had been going from bad to worse with stocks accumulating and sales position not improving despite perceptible drops in the prices of millmade cloth. It was only after the mills were about to curtail production and the threat of textile workers going out of employ loomed large over the horizon, that the Government came to the aid of the industry. In the first place, the export duty of 10 per cent on medium cloth has been abolished. Secondly, the textile duty on superfine cloth has been reduced from As. 3-3 to As. 2 per yard. Thirdly, the Government has decided to grant a drawback of duty on imported cotton used for manufacturing cloth exported from this country.

The spokesmen of the Indian cotton textile industry have failed to accord a hearty welcome to the aforesaid reliefs. They argue that even though the first and the third concessions are meant to provide a fillip to exports, no spectacular expansion of our trade in cotton textiles with the overseas countries can be expected. Already, the international market is riddled with keen competition. Both Japan and the U. K. have rehabilitated their cotton textile industry and proving themselves as our formidable rivals in the world textiles market. The abolition of export duty on medium cloth would have been hailed as a step in the right direction, had it been decided on a quarter of a year back. But in the altered circumstances of to-day, argue our textile circles, the measure is likely to fizzle out.

Moreover, the U. K. and Japan enjoy the advantage of a highly mechanised production and its consequential lower production costs. We may be sure that in the face of price reduction in respect of Indian cotton manufactures, our rivals in the world market will further strengthen position by reducing their prices and by offering better credit facilities. But here in India productivity is not adequately high, nor production cost sufficiently low, to enable us to so lower our prices as to face the competition of our rivals roundly and to our advantage. The excise duty on superfine cloth has been reduced and it can be expected that this measure will stimulate the domestic consumption of this type of cloth. But the improvement cannot but be a very slight one, the country's purchasing power being quite low and there being little chance of any improvement in this direction immediately or during the next four or five years. Ultimately, therefore, the prosperity of our cotton textile trade and industry will depend on the production as well as consumption of the cheaper varieties of cloth.

The grant of drawback of duty on imported cotton used in the manufacture of cloth exported from this country, is a measure which had been lying overdue for months before it was decided on. Import duty on this class of cotton had always been felt as a deterrent to the progress of the industry. It had affected the sale abroad and in the domestic market of not only the finer varieties but also the medium types of cloth in the manufacture of which imported cotton is used. This deterrent coupled with the export duty created a very difficult situation for medium counts cloth and now that the two hurdles have been removed it may be expected that the exports of this variety of cloth will receive a fillip. But whether or not such hopes may be realised will depend, more than anything else, on the trend of the word markets in textiles.

The drawback of import duty on raw cotton used in the manufacture of cloth meant for export can hardly be regarded as a concession. The duty on imported raw material of this kind has always been looked upon as an injustice by the industry. It is to be found nowhere else in the world and in this country too, other industries are entitled to a drawback of duty on raw materials imported from abroad, to be used in the manufacture of goods and articles

meant for export. The country's textile interests point out that the aforesaid concession, if at all so, can hardly help reduce the cost of production of cloth in the manufacture of which imported cotton is used and if we cannot reduce our cost of production sufficiently, we can hardly succeed in lowering our prices. This means that our rivals in the world markets will continue to keep us at a disadvantage as at present. We would like in this connection to refer to the comment made by Bombay's Commerce in its issue of Oct 31, 1953: "A further point that needs to be noted--is that a mere drawback of import duty on cotton is not sufficient, because it does not fully reimburse the industry the effect of import duties which the industry has been paying on fuel oil, dyestuffs, various types of mill stores, spares, chemicals, etc." It cuts no ice to argue that these articles are mostly available within the country. Even so, their prices are quite high. The grant of a drawback of duty on the imported varieties of these articles which are essential for the manufacture of cloth, would have set matters right and enabled the industry to lower its production costs as well as prices.

The industry takes the view that the Government is step-motherly in its attitude towards it and is rightly critical of its decision to continue the export duty on fine, coarse and medium counts unchanged. The Government knows fully well that the mills have already reduced their prices and and there simply is no prospect of reducing them further. Why then shoud the burden have been allowed to continue? The concession granted to superfine cloth will bring no appreciable relief, for the variety does not account for more than 5 per cent of the total cloth production in the country. The excise duty is quite high and it will continue to cripple, as before, the production of other varieties of cloth which constitute the remaining 95 per cent of our total production. Perhaps, if the sales of cloth had remained satisfactory, the continuance of the excise duty at its present level on fine, medium and coarse counts would have been justified. But since the market is already in the grip of a slump, the Government should reconsider the position and grant further concession to the industry by reducing the excise duty on fine and medium cloths. This will benefit all concerned,—the millowners, the workers as well as the consumers. It is indeed a sad commentary to say that our Government never cares to look around and apply remedies until the patient is pushed to the very verge of death and when, if at all, the remedy is applied, things must have got into a pretty nasty mess.

The industry is also pleading for an abolition of export duty on coarse cloth. Even though this type of cloth is in demand within the country and its export should not, therefore, be encouraged, the fact should be borne in mind that the advantage of lower cotton prices is offset by the rising production costs. It is contended that if the export duty is abolished, the mills will be able to lower the prices of this type of cloth and pay fairer prices to the growers of cotton. Not that cloth of this type is scarce within the country and the stocks lying unsold being quite enormous, it will be judicious to export a part of these at competitive prices and in order that it may come about, the export duty on coarse cloth needs to be abolished.

The future of our cotton textile industry will ultimately depend not on the grant of this concession or that, which is more or less in the nature of a temporary palliative, but on its capacity to lower prices both for the domestic and the oversea markets. This question is connected with that of lowering the cost of production which is felt to be quite high at the present moment. Since cotton prices will not come down, the industry would like to curtail the wage bill. There is cause for concern in the contemplated remedy as it will add to the complexity and volume of unemployment now prevailing here on a very appreciable scale. Throwing workers out of employ when they can hardly be given any alternative means of livelihood should be tolerated by no civilized government and it is good that our government has imposed certain well-meaning restrictions on those employers who retrench their employees as a last measure, that is, because there is nothing else they could do. Some argue that improved productivity through more efficient management, rationalization and a great degree of mechanisation, may improve matters. But here too the wolf of retrenchment should be kept at a distance or the wolf won't let things run as smoothly as they ought to.

A COMMON COMPLAINT

There is widespread discontent among the rationees of Calcutta and the surrounding industrial area over the alleged bad quality of the rice which they receive against their cards from the ration shops. The opposition M.L.A.'s recently crossed swords with the Government and members of the Government party in the State Legislature over this sad and sickening affair and it seems redundant to point out that neither side succeeded in keeping the debate confined within limits of decency and good taste. In our opinion, the debate which was riddled all over with hot words and angry exclamations, was in itself a glaring commentary on the evil effect of the consumption of rotten and rotting rice on human temper. The less said about its capacity to provide nutrition to the body, the better. All kinds of stomach troubles like diarrhoea, dyspepsia or dysentry, have existed in this city for quite some ages now. Perhaps, therefore, the Government do not feel perturbed if the incidence of these diseases undergoes an increase as a result of the consumption of inedible rice now being supplied by them.

We are glad to note, however, that Dr. B. C. Roy, the Chief Minister of West Bengal, came forward with a very sober statement in the course of which he resorted to plain speaking and offered an explanation, not altogether unconvincing, as to why the rationees are being given rice of a 'bad' quality. Our opposition M. L. A.'s make use of words and phrases which often border on the scurrilous and smell of the rice we have to take these days. What is worse still, they are out to make political capital out of the inconveniences and sufferings of our poor commonfolk. Officialdom, on the other hand, creates the impression that it is callous to the miseries of the people, by the indiscreet words it often flings at their political opponents. The public feels despondent. We, all of us, the non-political commonfolk of Calcutta, have begun to tire of the folly of the political fight between those in power and their opponents. Dr. Roy's sober and well reasoned statement is the only white spot on an otherwise dark canvas of obstinacy on the one hand and the jealous bid for power on the other.

One need not go into details to explain how very pitiable is the situation now prevailing. Since 1947 the quota of rice supplied in the rationed area has been going down. This has forced the consumer to take food which a few years ago he could not imagine he would be taking some day. Not only the rice he gets but even the wheat is of an inferior quality. Parboiled rice has vanished and the inedible *atap* is holding sway. Dust and stone chips too have made their way into rice and the amalgam we have to send down the throat certainly plays a havoc with our health. And this is no newfangled phenomenon. It has existed for months and years.

It is no use arguing we have to procure rice from other States where *atap* alone is available. We, rationees, are no beggars and the Government has no business to think that other States are making a gift of their rice to West Bengal. If it is beyond the capacity of our Government to either procure or supply adible rice, they had better end the rationing system altogether. Then again the contention that *atap* has to continue as our food in the absence of parboiled rice, whose supply has run short, cannot but be taken with-

out a large dose of salt. Plenty of fine rice is available in the black-market. How does it all get to be there? Cannot the Government end black-marketing altogether? Certainly, it can and should provided the rice content of the ration is raised sufficiently. We would advise the Government not to mince matters but go about into the most urgent task of improving them. Both quantity and quality of rationed rice need to be bettered.

OIL LAMPS INDUSTRY

Mr. B. N. Adarkar of the Tariff Commission recently threw light on the present plight of this industry at Bombay when he said, "The industry has already captured practically the whole of the domestic market and may in future have to depend on the export market for the disposal of its surplus output." Giving details he said that during the period of protection since 1946 the annual production of ten major units of the industry had gone up from 1.7 million lanterns in 1948 to 3.5 millions in 1952 and 2 millions in the first half of 1953. The present capacity for production of the industry thus is quite a bright one. But in case of withdrawal of protection the progress of the oil lamps industry may be affected adversely unless in the meanwhile steps are taken to lower its cost of production and improve the quality of its products. One of the major advantages that the industry enjoys is the availability of raw materials, like tinplate, blacksheets and steel wires, within the country.

SAGO INDUSTRY

The survival and healthy development of the sago industry depends largely on the steps that can be taken to reorganise it and improve its methods of production. This is what Mr. M. D. Bhat, Chairman, Tariff Commission, told sago manufacturers recently at Bombay. Mr. Bhat said that according to information supplied by Government, there were at present 109 units engaged in the manufacture of sago as compared with 40 units in 1950. All the units, we are told, are unregistered individual proprietory concerns and most of them are run on small cottage industry scale.

The annual rated capacity of the sago industry is estimated at 19,500 tons in 1950 and is stated to be 30,576 tons at present. Actual production of sago is about 6,000 tons in 1950, it increased to 21,577 tons in 1952 and during the nine months of January to September, 1953, it was 19,608 tons. The number of workers in the industry has also increased from 4,400 in 1951 to about 6,000 during the subsequent two years.

According to Mr. Bhat, the industry is one which requires encouragement and assistance both as a source of employment to the small man and as supplier of processed food. The industry at present is localized in Salem town and surrounding villages and to the people in that area it provides a welcome source of livelihood.

FOREIGN TRADE

According to the data made available by the Reserve Bank, the value of India's foreign trade has declined considerably in the first half of 1953 as compared with the previous half. Both exports and imports have registered a decline. The fall in exports (Rs. 62.4 crores) more than offsets the fall in imports and the merchandise account shows a swing of Rs. 53.5 crores the favourable trade balance of Rs. 18.6 crores in the previous six months having been converted into a deficit of Rs. 39.9 crores.

Preliminary figures of India's external payments position during the first half of 1953 showed that the earlier trend of surpluses has now given way to deficits. The accounts for the periods show that current

payments have very nearly equalled current receipts.

Since the middle of last year, India had been running a surplus on current account. By the end of the first quarter of 1953, it dropped significantly and a deficit of Rs. 13.6 crores emerged by the end of the second quarter.

"For the half year as a whole, the surplus on current account totalled only Rs. 0.5 crores, as against Rs. 63.5 crores in the previous half-year. For the year 1952-53, there was thus an overall surplus of Rs. 64 crores," the Reserve Bank Bulletin said.

Between the two half-years commercial imports rose by Rs. 2.4 crores to Rs. 211.8 crores in January to June, 1953.

"The larger payments for imports appear to be the result of a higher quantum of imports since the import price index showed a fall."

Government imports at Rs. 79.5 crores were Rs. 6.3 crores lower than in the previous half-year.

Exports fell by Rs. 63.4 crores, compared with the previous half-year, both prices as well as quantities declining considerably.

The terms of trade deteriorated during the half-year, being on the average 88 as against 91, in the second half of 1952.

Net invisible receipts fell by nearly Rs. 8.2 crores between the two half-years.

MR. THAKUR'S ADVICE

Addressing the Poona Rotarians Mr. B. T. Thakur minced no matter when he said that primitive economy could only provide primitive standards of living which had no place for mass literacy or public health demanded by present day democracies. The economic situation in the country has deteriorated and opportunities for employment have diminished. Mr. Thakur referred to some of the symptoms of this malaise such as, the diminishing State and Central revenues and arrears in the implementation of the Five Year Plan, coupled with worsening of trade in the private sector.

Mr. Thakur took the view that employment and prosperity could only be increased through greater and harder work coupled with modernisation of tools, supply of energy and improved know-how. He said that greater incentive was basic before progress could be made. The present Governmental economic policies, he added, were full of logical contradictions. Mr. Thakur held that major decisions by Governments in the economic field had continuously checked enthusiasm and capacity of businessmen and industrialists to take advantage of political freedom and to concentrate on economic expansion, which alone could cope with the rising demand for employment.

Mr. Thakur decried nationalization and emphatically pointed out that it was impracticable and costly and would not create prosperity. Nationalization has been tried and found wanting elsewhere and to imagine it could succeed in India is mere wishful thinking. The remedy suggested by Mr. Thakur is as follows:—

"A complete reversal of most of the policies and methods adopted since freedom and enlisting of fullest co-operation of business managers and financiers at all levels, including the highest ministerial positions in the States and at the Centre, were the only means which could create employment and prosperity. With slowing down of business all the world over and emergence of new nationalistic policies in friendly markets, external competition would further grow and India's national economy and public revenues would further deteriorate intensifying the unemployment problem."

INDIAN COTTON

It is feared that cotton prices will slump heavily if steps are not taken to help maintain cloth production at the present high levels. The average consumption of cotton by Indian mills at present amounts to nearly 3 lakh bales a month. But this high level of cotton consumption may continue only if the Government adopts a sound cloth policy. Already, the cotton maket is showing sluggish tendencies and the turnover of cotton firms has declined by 60 per cent.

The Central Advisory Board recently met in Bombay and made a number of recommendations. The Board wants the present quota system and zonal system to be suspended. If this recommendation were unacceptable to the Government, then, the Board recommended, the mills should be allotted with immediate effect, cotton equivalent to 100 per cent. of their consumption of Indian cotton during the season 1952-53. The Board recommends that mills should not be compelled to consume as much foreign cotton as they did in the past and so it suggested that mills which ask for increased allocation of Indian cotton, should be given such increase up-to 50 per cent. of their consumption of foreign cotton during 1952-53. The Government has accepted only one of the Board's recommendations, namely, that mills should be allotted cotton equivalent to 100 per cent. of their consumption of Indian cotton during 1952-53. The decision of the Government has been welcomed by cotton circles as it is expected to help the cotton market out of the apprehended slump.

MANGANESE ORE

Exporters of manganese ore are dissatisfied with the quota restrictions now prevailing under which shippers are allowed up-to 25 per cent of the best year's export of three years ended 31st March, 1953. They point out that the supply position of the ore is quite satisfactory. Reserves are estimated at about 60 million tons, while previously these were no more than 25 million tons. They further claim they have evolved a new process whereby the quality of low grade ores can be improved and also that the demand for it in overseas countries is growing. They want the export trade in manganese ore to be freed from the existing restrictions and argue that free trade will improve the country's now deteriorating employment situation and also help us earn considerable foreign exchange. India's manganese ore trade is expanding. Last year, she exported 1.4 million tons of the ore valued at Rs. 21 crores.

ENGINEERING INDUSTRIES

The Bureau of Industrial Statistics, Calcutta, recently made a survey of the small engineering industries located in the Howrah municipal area. The survey covers 762 firms. The small engineering industries have been defined for the purpose of the survey as those engaged in the construction, adaptation and repair of machine tools, both power driven and portable, by hand, in turning lump and sheet metals into utility products, in preparing moulds, in welding and so on. The licence fee, they pay does not exceed Rs. 50 per annum. The survey covers firms of the following five categories:—(1) machine, machine parts, tools and engineering stores manufacturing units; (2) sheet metal processing; (3) foundries; (4) nut, bolt, rivet, etc., manufacturing units and (5) welding firms.

The Survey reveals that most small engineering firms are either proprietory in character or partnerships. Their capital structure is very weak and some of them stand in bad need of new capital. Raw materials used are mostly indigenous. But often their supply is not satisfactory. It

has been suggested, therefore, that the present quota and permit system should be thoroughly revised in order to bring about improvement in the distribution of raw material to small industries. The workers consist of family members and outsiders who work on the 8-hour-a-day basis. The most prosperous are the firms mentioned in (1) of the above paragraph.

The small firms concerned occupy an important place in our national economy. It is claimed that properly organised, they can make a considerable contribution to the industrial development, as envisaged in the Five-Year Plan. The report of the survey suggests that a small engineering development committee may be set up, consisting of the representatives of the Government, small engineering firms and the consumers, to advise how the small engineering industries can be made to come into their own. Special attention needs to be directed to the question of providing both short and long-term finances to them. Steps should also be taken for the inspection of products and for the enforcement of standardised quality.

LAND REFORMS

According to the two U. S. experts who have examined the progress of land reforms in India, the large landowners here complain of lack of sufficient security regarding their properties and so they do not dare to undertake the work of agricultural improvement. They are following the clever practice of shifting tenants from plot to plot every year to avoid the possible achievement by the tenants of occupancy rights in land. Lack of credit facilities is another disappointing factor of our rural economy. It is only the medium-size owner cultivators who have dared to embark upon programmes of agricultural improvement. Any attempt to establish the order of equality this stage will lead to equality of poverty unless productivity is increased. As pointed out by one of the experts Mr. Kenneth H. Parsons, Professor of Agricultural Economy in Wisconsin University, the typical land situation which is emerging here is that of rayatwari holdings with a few large holdings, many medium and small-sized holdings and lawless village workers, constituting a third to a fourth of the rural population. Agricultural economy based on owner-cultivator farms enjoys certain distinct advantages. But Mr. Parsons regards as costly, the programme whereby tenants are sought to be converted into owners. Tenants will have to go into debt if they buy the land at anything like its current value. Payment by negotiable debts will lead to inflation while payment by non-negotiable bonds at low interest rates will destroy "the investment base of the intellectual and professional classes."

Mr. Parsons has suggested the creation of a regulated landlord tenant relation working towards:—(1) Security of tenure of tenants wherein occupancy depends primarily on the performances of good husbandry; (2) a division of the crop which gives the tenant an income above ordinary wages commensurate with his duty and his investment and working capital and to the landlord share commensurable with a prudent investment policy and the responsibilities of management; and (3) both landlords and tenants must assume shares of variable non-labour costs in approximately the same proportion as division of the crop.

Mr. Parsons wants that some clear-cut and positive production plan should be laid on the shoulders of the landlords and only if they fail to accept or work it out, should be taken the drastic remedy of transferring the ownership of lands from landlords to cultivators.

On the question of ceilings on holdings, Dr. Parsons says that ceilings could be justified only if they were high enough to permit efficient farming under Indian

ons. He has asked the central
ment to formulate minimum stand-
of landlord-tenant relations which
promote and protect minimum
rds of cultivation and the use of
s well as the minimum rates of re-
to tenants. Rural education and
es must also be provided on the
ant scale.

ESAI TOUCH

ombay's Chief Minister, Mr. Desai
a public meeting recently held in
dabad that it would be a betrayal of
tma Gandhi if the people of India
p his gospel of swadeshi. Many will
by him as far as his advocacy of
onsumption of indigenous goods is
ned; but the less we talk of betrayal,
tter. In fact, the erstwhile followers of Gandhiji have already betrayed him on so many fronts that they had better keep quiet on the question of betrayal. A typical example of officialdom's uncanny kanck of blowing hot and cold in the same breath is provided by Mr. Desai's plea that the use of indigenous goods does not mean any kind of xenophobia on our part. Mr. Desai believes that cottage industry goods help to bring about greater prosperity in the country than the goods put out by the big industries. He was also heard to deprecate what he described as the "scare about unemployment." But all of us are not Neros and none should cry us down if we cannot afford to fiddle when Rome is burning. Mr. Desai's estimate, however, is significant enough in as much as it shows how officialdom here segregates itself from the people by an aloof wall of artificiality.

The Reclaiming of Used Lubricating Oil

Economies in the annual bill for lubricating oil are effected much more satisfactorily by the careful recovery or re-use of the dirty oil than by the purchase of cheaper material. The expense of lubrication lies chiefly in the wastage of oil. One of the simplest ways of keeping down cost is to use the waste oil from an engine on some cruder plant and in Quarries and Collieries it is quite customary to lubricate runways, chains, etc., with the spent oil from the Power House. When the installation provides no opening for this kind of "secondhand" lubricant or when the Power Plant is oiled by a circulatory system, it is desirable to instal some sort of recovery plant. The choice of oil reclaiming system employed depends upon the quantity to be treated and the desired puirty of the recovered oil.

For a few gallons per week it is obvious that a costly installation is uneconomical and there is also nothing to be gained by producing a "perfect filtrate" for re-use on some comparatively rough mechanism. On the other hand a Power House containing a number of Diesel units or steam turbines requires a good recovery process giving a clean product and necessitates the choice of an easily treated oil when originally filled and for daily "make up."

Depending upon the requirements, six methods of purification of dirty oil are available, namely:—

(1) Simple settling or clarification.

(2) Settling assisted by simple gravity filtration.

(3) Purification by passage of oil through hot water, or of chemically treated hot water through oil.

(4) Clarification by removal of impurities by chemical means.

(5) Filtration by centrifugal machines.

(6) "Edge" Filtration.

The above classification includes all the usual "practical" appliances on the market but there are possibilities for the use of earth "contact" processes, in which a real refinement of the oil takes place, for installations where the recovery runs into tons per week. Roughly speaking where the quantity of oil to be treated is less than fifty gallons per week, methods (1), (2), and (3) are applicable unless the special requirements call for an exceptionally clean oil.

The simplest method consists in allowing the dirty oil to stand in a tank, preferably warm, with taps at different levels to draw off the clarified material. The clarification is very slow and the losses are big, and it may happen with certain oils that they persistently refuse to become clear. Moreover, it is impossible to remove colloidal carbon in this way so that the oil remains black.

An improvement can be effected by settling the oil in the first place and then causing the settled product to traverse a filter pad, such a device is manufactured by A. C. Wells & Co., but again the process is slow although a better recovery is obtained.

The impurities to be removed from dirty oil may be broadly classified as:—

(1) Water.

(2) Metallic particles from engine wear and "grit" from the air and floor—in automobiles, road dust.

(3) Particles of carbon produced by the decomposition of the oil at high temperature.

(4) Fuel from I. C. engines—petrol, kerosene, heavy fuel oil.

The first three of these classes are suspended in the oil in particles of appre-

ciable size and can therefore be removed by mechanical means except in the case of colloidal carbon, when chemical assistance is required. Fuel on the other hand is dissolved in the oil and can only be removed by a process of distillation. The plant required for waste oil recovery comprises a preliminary treatment tank, a filtering device and a cleaned oil storage vessel. The clarification can be accomplished either by a centrifugal machine, working on the cream separator principle, or by an edge filter. There are several makes of the former on the market differing in the detail of design and arranged to run at various speeds from 6,000 R. P. M. up to 15,000 R. P. M. The general principle of all such centrifuges is to magnify the force of gravity to produce a rapid settling out of the insoluble impurity. The centrifugal forces depending on the speed and diameter of the rotating bowl are claimed to be as great as 13,000 times that of gravity, in the device of Sharples, but the efficiency of cleaning is also dependent on the design of the separation chamber or bowl.

The "edge" filter embodies rather a novel principle. It is found that if a liquid containing particles is forced against a pile of thin sheets placed like a pack of cards, the solids are retained at the "edges" of the sheets and only the clear liquid passes between the sheets. In practice the filter medium consists of thin annular discs of either paper of metal built into the form of a tube and immersed in the oil under pressure.

Whatever method of filtration is chosen, the quality of the filtrate can generally be improved by a preliminary treatment, although this is by no means essential if the oil to be recovered is not dirty and a high degree of purification not required.

The simplest treatment consists of subjecting the dirty oil to the action of boiling water in a tank for a few minutes and then allowing to settle before passing the supernatant oil through the centrifugal or filter. About equal volumes of water and oil are taken and it is useful to add to the water about 2 per cent. of some weak alkali such as Trisodium Phosphate, Sodium Silicate, or Soda Ash. This causes the finer particles to coalesce and separate. In some cases great success has attended the use of special chemical treatment. For example, manganese resinate is dissolved in the hot oil, and a boiling aqueous solution of sodium silicate mixed with it. Insoluble manganese silicate is formed on which the colloidal carbon is deposited and so easily removed. The best treatment to adopt depends on the particular conditions but it is always advisable to see what happens by simple filtration or centrifuging before resorting to special methods since in most cases a sufficiently clean oil can be obtained by mechanical means. Petrol can be partially removed by heating the oil, preferablly a vacuum but there is no simple way of eliminating kerosene or heavy fuel oil.

In conclusion it should be noted that the quality of the original lubricating oil largely influences the recovery process and in general a poor type of oil presents greater difficulties and losses in purification than a high grade well-refined product.

Provided the dirty oil has not been badly contaminated with fuel oil it is possible with these centrifugal machines or streamline filters to effect an excellent cleaning and recovery of "used" oil and such recovered oil is quite suitable for further use in engine; in fact, except that it is somewhat darker in colour—a point of no importance—the lubricating properties are fully maintained. It is, of course, desirable to see that the viscosity of the filtered oil is not materially different from the original.

The Technique of the Wet Shampoo

Before hair can be successfully dyed it is nearly always necessary for it to be thoroughly cleansed and degreased. Hence a consideration of the practical art of hair-dyeing must start with that of washing and cleansing the hair, or,, as this process has become universally known, shampooing.

The art of shampooing the hair is an ancient one which has been much developed in recent days by the introduction of almost innumerable varieties of shampoos —shampoos in powder form and liquid form, dry shampoos, spirit shampoos, oil shampoos, medicated shampoos, and shampoos containing tinctorial principles such as chamomile, henna and rhubarb, further variety being introduced by the use on the part of manufacturers of various, and sometimes distinctive perfumes, designed to increase the attractiveness of their preparations. The latest and most important development from the point of view of shampooing as a preliminary to dyeing the hair is the introduction of soapless shampoos.

From the operative point of view, shampooing and the preparations used for the purpose may be roughly classified in accordance with the liquid employed, as under:—

(a) Wet shampoos—water.

(b) Dry shampoos—alcohol or other volatile liquid.

(c) Oil shampoos—various oils.

It may be added that the name "dry," which, in deference to trade usage, we adopt for class (b), is really a misnomer, the term properly applying to powers used as such for cleansing the hair without mixing with water or other liquid. These are almost obsolete, and are in any case absolutely worthless as a preliminary to hair-dyeing.

In this chapter we are concerned with shampoos in which the liquid used is water.

SOAP-CONTAINING AND SOAPLESS SHAMPOOS

As already indicated, the preparations for use with warm water for shampooing the hair are put up in two main forms, shampoo powders and liquid shampoos, to which may be added the cream or paste form packed in collapsible tubes, which has recently made its appearance.

Some authorities recommend the use of a simple solution of ½ per cent. of washing soda in water for degreasing the hair prior to dyeing; but soap, especially if used in conjunction with a little alkali, is more effective.

Hair dressers usually prefer to use their soap in liquid form. Liquid soaps or shampoo lotions based on soap consist essentially of strong solutions of soft soaps in weak alcohol, usually containing some free alkali. Soft soaps are made by saponifying suitable oils, such as olive and palm oils, with caustic potash whereas hard soaps are made by saponifying suitable oils and fats with caustic soda. Glycerine is produced at the same time, and, in the case of soft soaps, is allowed to remain mixed with them.

As illustrative of the composition of liquid soaps or shampoo lotions based on soap, the following formula may be quoted:—

Soft soap	200	grams.
Alcohol (90 per cent.)	200	c. c.
Ten per cent. solution of potassium hydroxide	20	„ „
Perfume		q. s.
Distilled water	to 1	litre.

The composition of the coconut oil shampoos follows along similar lines, these

preparations being made by saponifying coconut oil with caustic potash so as to form a soap.

Even more effective as degreasing agents are the modern soapless shampoos, some of which are alkali-free or even give slightly acid solutions. These products are excellent for shampooing the hair prior to dyeing it. Alternatively, sulphonated lorol in powder form may be used, care being taken to dissolve it completely in warm water, or a 30 per cent. solution of sulphonated lorol liquid TA may be used in the same way as liquid soap is employed.

In any case, when the hair is to be dyed with henna, the use of a neutral or slightly acid shampoo is strongly advised.

THE METHOD OF WET SHAMPOOING

To shampoo the hair properly necessitates a constant flow of water, of which the temperature can be regulated, and skill on the part of the operator. Moreover, it can best be done by some one other than the person whose hair is being washed, for the one reason, if for no other, that it is difficult to see the back of one's head; and the competent hairdresser, therefore, is the best person to be entrusted with the operation. The process, indeed, may seem too well known to stand in need of a detailed description; but there are a number of points in connection with it which call for consideration and emphasis.

And, first of all, let us say that the wet shampoo should be made as pleasant as possible. The client must be seated comfortably close to the basin and not required to lean over it longer than is absolutely necessary, and the operator must take care that the water flows at the right temperature as dictated by the client's taste.

The client being properly seated, the hair is brought over the head so that it falls clear of the towels and the sides of the basin.

The back shampoo basin is greatly favoured abroad and is becoming increasingly popular in Great Britain. This basin allows the client to recline backward with nape of the neck resting on the edge of the basin. By this means, it avoids the uncomfortable, and in the case of obese women, often dangerous, position of bending forward. The other advantage of this position is that facial make-up is not disturbed by water running down the face. The chief disadvantage of the method, however, is the liability that the hair at the neck may not be properly cleaned or rinsed. Care, however, obviates this. Certain psychological factors, moreover, render the new method more suitable for saloons where the shampooing is carried out by female operators.

The hair is thoroughly saturated with water, the water being directed on to the head by means of the rose. This preliminary rinsing must be thorough.

Just as the grease prevents the dye from penetrating, so it will prevent the warm water from thoroughly wetting the hair. But saturation of the hair is an essential preliminary to a good shampoo. It is therefore necessary to squeeze the water into the hair with the free hand during the first rinse, lifting and separating the hair to ensure perfect distribution of water.

After the preliminary rinsing has been effected, the shampoo lotion is poured on to the head by the operator's left hand, and at the same time worked into a lather with the right. Both hands are used as soon as the lather forms freely. The lotion is then worked thoroughly into the hair with a massage-like movement of the fingers. The method of doing this is of fundamental importance, as thorough cleansing depends upon the correct move-

ment of the fingers. These should always be held in a clawlike fashion. Adherence to this plan will obviate any danger of the hair becoming entangled; and the method is an excellent one for loosening dandruff and other deleterious matter which may cling to the scalp. Moreover, a rotary movement of the tips of the fingers is not only best from the point of view of cleansing the hair, but it invigorates and produces a pleasant sensation in the scalp.

It is advisable to lather twice, the first lather being well rinsed away before the second is produced. It will be found that the second lather is produced more easily from the first. for the reason that the major portion of the grease will have been already removed. There are exceptional cases where, for example, there is an excessive secretion of sebum or where there has been over-use of greasy dressings, in which it will be found necessary, when soap is used, to lather three times in order completely to cleanse and to degrease the hair.

During rinsing, it is desirable that the hair should be kept on the move by means of the operator's fingers, in order to allow the water to penetrate: and the rose must be held close to avoid splashing. The water must be carefully directed in the vicinity of the forehead and around the ears in order to prevent it, so far as possible, from running over the client's face; and his or her wishes should be consulted with reference to changing the temperature from hot to cold. This rinsing must be very thorough when soap has been used, since the first water added breaks the lather down, turning it to lime-soap scum, which deceives one into believing that the lather has been washed away.

When shampooing a lady with long hair, the hair, after rinsing, should be gathered up in the hands and as much water wrung out as possible; preliminary drying is then effected as follows:—The operator holds the long hair with one hand and brings the towel forward to the forehead with the other. Without loosening the towel from the neck, he rapidly wipes the neck and around the ears, and presses the towel to the forehead. The client is then asked to sit in an upright position.

In some establishments one large, heavy towel is used for shampooing, while in others two are employed, one being tucked round the neck and used for preliminary drying as described above the other employed in addition to absorb more of the moisture preparatory to complete drying with the mechanical dryer. In every case a small towel should be given to the client so that he or she can place it over the eyes.

In the case of a heavy head of hair, it may be necessary to wring in the towel, in which case the position of the left hand should be underneath, the right hand working on the top in a direction away from the scalp.

The best position for the operator to take up during preliminary drying is not immediately behind the client, but somewhat to one side, in which position it will be found easy to rub the back and sides of the head in an upward direction. When the top of the head is being rubbed, the operator must take care to avoid flicking the client's face with the towel.

We consider it important that the hair should be dried as completely as possible with towels before the mechanical dryer is brought into use. When it is wet with water, hair, is shown by Dr. Leftwich, stretches considerably more than it does in the dry state. The effective drying of hair after a shampoo is, therefore, a matter of great importance, although, unfortunately, this is not always recognised.

AN ALTERNATIVE METHOD OF SHAMPOOING

The use of shampoo lotions renders possible an alternative method of shampoo-

ing which has been found to be not only very efficacious but pleasant to clients, as it entails a shorter period of leaning over the basin.

The method is as follows:—The client is enveloped in the usual dressing cloth, one towel being placed across in front, another at the back. The hair is well brushed and parted down the middle. In the case of a lady who has not yet succumbed to fashion's dictates and had her hair shortened, the parting must be carried to the ends of the hair. If the hair is extra thick, it may be divided into three or four sections.

The hair is then thoroughly moistened with bay-rum, toilet cologne, perfumed water or antiseptic solution. This is effected by means of an ordinary saloon spray, the hair being well brushed during the operation. When the hair is thoroughly wetted, a small quantity of the lotion is applied, about 6 c. c., or, roughly a teaspoonful, being usually found sufficient for this purpose. The lotion is worked well into the hair and scalp in order to obtain a good lather, after which the head is rinsed for a moment under the rose, the client leaning over the basin.

A thorough massage follows, effected by the fingers held in the claw-like fashion already indicated and moved in a rotatory manner. This process produces very considerable lathering, the lather being of the right consistency to effect a thorough cleansing. The massage is continued until the scalp is quite free from deleterious matter. The lather is then rinsed off and a second lather produced in a similar manner, the hair being finally rinsed and preliminary drying effected as in the method previously described.

It will be noticed that during the major portion of the time taken by a shampoo effected in this manner, the client is sitting up in the chair, able to converse in perfect ease and comfort. The somewhat disagreeable necessity of hanging the head over a basin is reduced to a minimum. Nevertheless, the method entails a maximum of cleanliness. Not only is it pleasant, but clients of both sexes have a distinct preference for a process like this which can be seen.

This method of shampooing, if correctly carried out, obviates the danger of leaving the hair dull and mousy in appearance or in a sticky condition. The latter is an important matter when hair is shampooed preliminary to hair-dyeing. In order to assure satisfactory dyeing, it is essential that the hair is thoroughly cleansed from grease and is not left in a powdery or tacky condition. Thorough rinsing is imperative. It is nonattention to this fact which often accounts for shampoos being unsatisfactory in their effects.

DRY SHAMPOOS

As already mentioned, the term "dry shampoo" is commonly applied to preparation based on alcohol or other volatile liquids, the commonest resembling ordinary soap shampoo lotions in composition but having a higher alcoholic content. The use of these preparations is unsuitable as a preliminary to hair-dyeing, as they do not sufficiently degrease the hair, the grease being redeposited as the volatile liquid evaporates. Even if rinsing with water is resorted to, there cannot be efficient degreasing unless so much water is used as to convert the dry shampoo into a wet one.

Imitation Pearls and Tests for Detecting them

Like many other things of value, pearls have been imitated. Some of the imitations are very natural in appearance, while others are very imperfect representations. For many years the Chinese small flat metallic figures between the shell and mantle of the Dispus plicatus, a large river mussel of that country. The figures are inserted carefully so as not to injure the mussel, which is returned to the water.

After a few months the mussels are again taken from the water and the figures are found to be covered with pearly nacre and are attached to the shell. They are then removed and used as ornaments.

The Japanese are more progressive in the art. They insert small porcelain domes inside of the Avicula Mertensii, or Oriental pearl oyster. After four years the oysters are taken from the water and opened and the culture pearls and the natural pearls are gathered from them.

The low domes become covered with layers of pearly nacre and when the culture pearls are separated from the shells they are joined to other domes of mother of pearl of similar shape and size. They are then mounted in jewellery in such a manner as to conceal the lower mother of pearl portion. The Japanese culture pearls are separated from the shells they are joined to other domes of mother of pearl of similar shape and size. They are then mounted in jewellery in such a manner as to conceal the lower mother of pearl portion. The Japanes culture pearls have a fine tender lustre and except for the mother of pearl base they have the appearance of genuine oriental pearls. Many of these are sold in this country to those who do not know their real quality.

The Japanese culture pearl is not entitled to the name of pearl because it is formed on an artificial base, and a portion of it is artificial. In case they should ever become "sick" they cannot be improved by "peeling," as the genuine pearls are improved, for the "peeling" process would expose the porcelain dome.

They are sold as Japanese culture pearls. The Japanese pearl industry is located in the Bay of Ago, Province of Shima, on the Pacific of Central Japan, near the famous temple of Ise.

If a system of pearlculture can be developed in which pearls can be produced through the natural method, using parasites as nuclei for the pearls, such pearls would be genuine in every particular and should be sold as pearls without discount or apology.

A very clever imitation has been recently placed upon the market. These are known as hard pearls and are made by coating a series of hard enamels over a suitable base. The system of building up the pearls from the inside with each strata of enamel completely enveloping the layers already formed is very similar to the natural growth of pearls.

The enamels which are used for this purpose are compounnds of glass with different metallic oxides which produce the different colours. These are fused together at a very high temperature. The powder is mixed with water and applied of "charged" to the object to be coated by means of a small spatula.

After each coating of the enamel the pearls are placed in a muffle and heated to a high temperature by electricity or gas.

The muffle is an oven made of fire clay. When the pearls are "fired" sufficiently the enamel fuses and they are ready to be

taken from the muffle. When they are cool they are "stoned," in which process all rough parts are filled away with fine carborundum or emery stones.

When the pearls are "stoned" nicely another coat of enamel is applied to them and when they are dry they are "fired" again and "stoned," and so on until the pearls have been built up to required size. They are then stoned and polished and ready for use. They are very fine representations, but as far as colours are concerned the art has not reached the highest state of perfection. These can be distinguished from the genuine by their weight and texture, while their shiny surface suggests their glassy formation. They are, however, one of the best imitations. Another clever imitation is the fish-skin pearl. The method of making these was discovered in the seventeenth century. Hollow glass bulbs or beads are coated on the inside with a composition which contains a large per cent. of guanine, the mucus which lubricates the scales of the bleak fish. This was originally called "Oriental essence," and still goes by that name in Ecouffliance and Ponts-de-Ce.

The bleak is the only river fish in France that is not used for food. They are very abundant in the Seine, Marine, Moselle and Escaut Rivers. The fishermen use nets and catch the fish by thousands as they travel in shoals in the current

To obtain the "Oriental essence," the fish are scrapel over a shallow tub containing a small amount of water. The scales are then washed and pressed and the essence settles to the bottom of the tub. It requires 20,000 bleak fish to furnish one pound of the essence. The essence is very brilliant and if a drop of it is allowed to fall upon water the guanine floats and spreads, exhibiting many brilliant colours.

The "Oriental" essence is packed in tin boxes with ammonia and sent to Paris where it is used in manufacturing the fish-skin pearls. Many of these imitations have a very delicate cream colour and simulate the oriental pearls. They can be distinguished from genuine pearls by their weight and glassy shine.

Glass beads are very commonly used as imitation pearls. Some are made of opal glass and covered with several layers of isinglass with another coating of a mixture of turpentine and copal oil and afterwards a thin layer of tinted soft enamel to give it oriency. Some opal glass beads are treated with flouric acid. They have a ground glass appearance, however, which reveals their nature. Hollow glass pearls can be distinguished in several ways. They are usually coated on the inside and filled with wax. The ink spot test is a good one. If a small drop of ink is placed on one of these filled beads, two spots can be seen when the pearl is held between the eye and the light. One of these is the reflection of the ink spot and is one the inner well of the bead resting against the wax. The reflected spot has a lighter colour than the original. There would not be such a reflection in a genuine pearl. Hollow beads usually have one or two holes in them. These are smooth in the glass beads, while the holes in real pearls have a rough chalky appearance. Then too, the glass beads which are filled with wax nearly always appear to have rings in the glass around the holes.

The hollow glass beads are much lighter than genuine pearls.

The solid glass beads are much heavier than real pearls and are not transluscent near the edge of circumference like real pearls.

Black pearls are imitated by making balls from hematite and polishing them. They are, however, much heavier than real pearls.

Some very poor white pearls are drilled and temporarily coloured by boiling them in a black colour which penetrates through the strata of the pearls. These often have a bronze appearance and one should be suspicious of dark coloured pearls that have been drilled.

Some gray pearls are simulated by making balls of mother of pearl and covering them with silver. Their weight and specific gravity are the same, but there is a difference in their lustre. "Mock" pearls are those made from mother of pearl and polished. They have no lustre and are otherwise easily detected. Another poor imitation is made by grinding mother of pearl to a powder and soaking it in vinegar and mixing it with gum tragacanth. This mixture is formed into balls and when partially dried they are placed in a loaf of bread and baked in an oven, after which they are coated with a fish solution to give them a lustre.

Other poor imitations are balls made of plaster of Paris, which are afterwards soaked in oil.

The most deceptive imitations are the Japanese culture pearls, the "hard," or enamel pearls and the best fish-skin pearls.

The Decoration of Tinplate

Tinplate is a material admirably suited as a basis for decorative effects obtainable by printing.

The major application of tinplate is in the canning industry, typified in the open-top can, and such containers are generally decorated by the application of adhesive paper labels. There is, however, a large and increasingly important industry devoted to the production of specialline cans, speciality containers, closures, display signs, etc., the majority of which have their appearance and sales appeal enhanced by decoration printed on the metal surface itself.

It is not possible to form an accurate estimate of the amount of tinplate used in the manufacture of these articles, since the statistics do not refer to such a classification. It is, however, reasonable to suppose that not less than 30 per cent. of the world consumption of tinplate is decorated to a greater or less extent by printing or varnishing the metal surface.

Decorative effects on tinplate range from the single colour coating of a bottle cap to reproduction of master paintings and intricate designs, involving many operations for their successful presentation.

Coatings are applied to tinplate for two purposes: namely, protection and decoration. The first of these is typified by the lacquers or enamels applied to the insides of open-top cans, the second by printed tin boxes. Coatings of either class may, however, exhibit incidentally the essential property of the other. For example, the appearance of the inside of an open-top can is often enhanced by the gold colour of the lacquer. Conversely, the protective properties of decorative coatings are well recognised. Thus, although it is theoretically unsound to draw a line of demarcation between the two processes yet in practice the division is sufficiently real.

The story of the development of the processes employed in the decoration of tinplate by printing, from the laborious methods of handpainting to the high-speed rotary offset press of to-day, has naturally been closely related to the history of the whole printing industry.

In the scope of this review it would be out of place to attempt to deal completely with the history of printing from Caxton onwards; and therefore only those developments which are definitely associated with metal decorating processes will be considered.

LITHOGRAPHY

The great majority of printing on tinplates is nowadays done by lithographic offset methods. Details of the invention and early development of the process are therefore not without interest to tin-printers.

The process of lithography was discovered and applied by Alois Senefelder in 1798. As a young man, Senefelder found himself interested in the printing of manuscript, and in view of the necessity for personal economy, was experimenting in the art of etching music-plates. In the course of these experiments, he obtained a piece of Kelheim stone designed for use as a block for mixing inks, and it was somewhat fortunate for the printing industry that Senefelder was residing at this time in the district now famous as that producing the porous calcareous mineral known the world-over is "lithographic stone." At one time, having no paper handy, he wrote some figures (actually a laundry bill) on this stone block, and later by an inspiration, etched the block with dilute nitric acid, thinking that such procedure would possibly lead him to a simplified method of making his music plates. The result of this experiment was brilliantly successful, and he achieved what is best described as a process of reversed intaglio printing. This process, as he used it in its early days, however, was naturally rather arduous since it involved tracing all his manuscript backwards. It was not until he had been working in this way for some time, that there dawned upon him the principles of lithography as they are known to-day. These principles, discovered, applied and patented by Senefelder at the close of the eighteenth century, may be enumerated briefly as follows:—

(a) The calcareous Kelheim stone (in common with some other similar minerals) has an affinity for greasy substances. The compounds formed by this combination are insoluble in water and remarkably impervious to chemical and mechanical attack.

(b) The stone is porous and easily takes water on to its surface.

(c) Aqueous and greasy substances mutually separate.

Working on these basic principles, the process Senefelder used was at once simple and effective. By means of a later development the design or manuscript was drawn on paper with a greasy ink, and transferred by rolling to the highly polished surface of a block of Kelheim stone. The design was then etched slightly with dilute nitric acid, covered with a thin film of gum arabic, and was at this point ready for the printing process. After the various portions of the design had been damped and inked, the print was taken off on a very simple hand press.

Although these principles stand to this day as the basis of all lithographic printing, three developments of major importance have assisted the process of lithography to its present position.

MEATALLIC PRINTING PLATES

The first of these is the invention and application of metallic printing plates. The disadvantages associated with the inconvenient bulk and weight of large lithographic stones had been realised for many years, and the lithographic industry therefore received the invention of the lighter and more convenient metallic printing plate with a considerable amount of satisfaction. Previously, attempts had been made to minimise the difficulties con-

nected with the cumbresome nature of the stone, the most important of these being the so-called "stone papers," consisting of a thin card coated with a porous calcareous cement. Various disadvantages, however, prevented any wide application of this material. It was not until late in the nineteenth century that zinc and aluminium printing plates achieved any material success. The properties of metal plates had been realised for nearly a hundred years previously, however, and there is little doubt that their sudden adoption was due, to a large extent, to the invention of the rotary printing machine, coupled with improved manipulation of the metals by the lithographic printer.

ROTARY PRESS

Although considerable progress had been made in the mechanisation of the printing process, it is quite obvious that all machines using stone blocks were necessarily of the flat-bed type. The disadvantage of reversing motion in machines, which would otherwise be capable of running at very high speeds, fully realised, but it was not until metallic printing plates became generally available that the big step forward to continuous rotary printing machines could be made.

OFFSET METHODS

In a review dealing essentially with tinprinting it is interesting to note that the process known as offset printing was invented and patented for the purpose of decorating metal sheets. It was not until this process had been in use for some twenty years that its application to the more general field of paper printing was realised (or at any rate exploited).

One of the primary difficulties concerned with decorating metal surfaces is the hard and non-resilient nature of the material to be printed. It therefore appeared desirable that the necessary resilience should be provided in the material of the printing surface, and in 1875 the "blanket" was introduced—a soft printing surface interposed between the lithographic stone and the metal sheet.

PHOTOLITHOGRAPHIC

The application of photographic methods of copying to lithography has had two important effects. First, it has eliminated the artistic, but somewhat arduous, operations of hand copying and drawing on stone or transfer: and secondly, it has resulted in a considerable extension of the field of application of the lithographic process. In the first particular it must be stated, however, that some very beautiful and intricate examples of chromolitho work were produced before photographic methods of reproduction become generally available. For certain contemporary lithographed tinplate layouts, hand chromolitho is still used, and gives a classic effect very favourable to the character of certain designs.

It is possible to reproduce on tinplate any design that may be printed on paper. The chief difference between printing on paper and printing on tinplate lies in the fact that in the latter case no drying by penetration of the ink can take place, and it is therefore necessary to stove each ink coating immediately after it is printed and before the addition of a second coating. There are also obvious differences of colour and brilliancy between the surface of tinplate and that of paper, but these may be overcome or utilised, as the case may be; and the difference in drying procedure is the only basic distinction between paper and tinplate printing. Other distinctions are those of practice, and cannot be considered as fundamental.

PREPARATION OF PRINTING PLATES

Before it is ready to be sensitised for reception of the photographic image, it is necessary for the surface of the metallic printing plate to be "grained." The plate,

which is of zinc or aluminium, is placed in a wooden tray and rumbled with an abrasive consisting of a mixture of marbles and sand. Sands of different sieve analyses are used according to the type and fineness of grain required, and the marbles may be of wood, glass or porcelain. Abrasive materials other than sand are also occasionally employed, e. g., pumice, glass, flint, emery and carborundum. In certain cases such materials are said to have the advantage that they do not wear so quickly into a slime. The degree of grain is periodically checked and when the surface of the plate is in the correct condition for the class of work in hand, it is washed, care being taken that all particles of abrasive material are removed.

SENSITISATION

The next step in the preparation of the printing plate is the coating of its grained surface by the application of a light-sensitive solution of albumin and ammonium dichromate. A typical solution contains approximately 600 grains of albumin, 150 grains of ammonium dichromate, in 20 oz. of water containing 2-3 per cent. of ammonia.

The operation of coating printing plates with this solution is carried on in a machine known as a "whirler." The plates are usually first washed with dilute nitric and acetic acids, and the light-sensitive solution is then poured on, the formation of bubbles being avoided as far as possible. This sequence of operations is usually carried out in the whirling machine, which is essentially a device for rotating the surface and place is kept whirling speed, which averages approximately one revolution per second. The solution is thus evenly distributed over the whole of the surface and place is kept whirling until dry. Drying may be accelerated by heating: but if this is done the heating should be very gentle, as the albumin will otherwise coagulate to its insoluble form, resulting in a rather fuzzy reproduction in the printing process. The printing plate is now ready for receiving the image.

PREPARATION OF THE NEGATIVE

The negative used for printing down the positive image on to the sensitised printing plate is prepared by photographing the original (which may be drawn by artists or copied, for example, from an old master painting) in large cameras which are specially designed for this purpose. For half-tone photo-litho work the usual cross-line screen is placed between the lens and the sensitised photographic plate. For colour photo-litho work, filters are used, and the image of each colour is taken on a separate negative. After the negative is developed in the usual way it is generally found necessary to correct the colour values, and methods for doing this have been subject to much development in recent years. Corrections may be done by hand on the original negative, or on a proof positive printed from it; in the latter case, a second negative has to be made for printing the press plate. Now-a-days, however, considerable attention is being directed towards a chemical method of correction known as "dot-etching." The dot-etch or dot-reduction method essentially depends on the well-known reducing properties of Farmer's reagent, a solution consisting of potassium ferricyanide and sodium thiosulphate. This solution operates by dissolution of the silver deposit round the the edges of a half-tone dot; thus without reducing the density of the dot the size is decreased.

Printing the positive on to the press plate from the negative is a similar operation to ordinary photographic printing. When the unit of design is small, however, the "step-and-repeat" camera may be used. This is a photographic device, which is employed to repeat side by side

many small images of one design. The chief feature of the "step-and-repeat" camera lies in its lateral adjustments, which must be extremely sensitive and accurate in order that satisfactory regisration may be obtained. A typical application of the "step-and-repeat" method is in the preparation of those printing plates which are to be used for the decoration of crown corks and other small closures. In this case up to five hundred similar designs may be put down on to a single printing plate.

After exposure the plate is developed by rubbing up with a greasy ink, this operation involving coating the whole of the surface of the plate with a uniform film of black ink. When the inked-up plate is washed with water, the coating remains adherent only to those parts where the sensitising film has been coagulated by the action of light. Thus the design will be seen reproduced as a black image on a clean metal surface. The uninked portions of the plate are then subjected to a treatment to render them receptive to water and consequently ink-repelling. This is done by treating the surface with a dilute acid or a mixture of acidic salts (a procedure known as "etching," although there is no marked removal of the metal) and finally coating with a concentrated solution of gum arabic in water which is allowed to dry ("gumming-up"). In some instances the design on the plate is strengthened by the application of a water-repelling asphaltum varnish.

TIN-PRINTING INKS

Inks used in the decoration of tinplate are normally more quick-drying than those used for paper and card printing, the possession of this poperty being necessitated by the non-absorbent character of the material being printed.

In general, a tinplate-printing ink may be said to require four fundamental characteristics:—

(a) Resistance to change of colour, darkening, and loss of tone during the stoving operation.

(b) Good adhesion to the metal surface coupled with sufficient elasticity.

(c) Quick-drying properties.

(d) Non-reaction with the protective coating of varnish.

There are two types of inks normally used for decorating tinplate: the transparent inks, more generally known as lacquers or varnishes, and the opaque inks typified by base-white. The first type may be considered as dyed varnishes, organic dyes being mainly used for pigmenting. The second or opaque type consists of oils (linseed oil, tung oil, etc.), thinners, driers and pigments. The composition and manufacture of these inks are ably taken care of by the printing-ink manufacturers and it is only necessary to mention a few of the more fundamental points here.

The balancing of an ink to the conditions of the stoving oven is an operation which requires a considerable knowledge of the oven conditions, the nature of the varnish to be used and the characteristics of its constituents. Pigments themselves may act as driers; for instance, lead carbonate, a popular white pigment, acts strongly as an oxidising drier. Titania has on the other hand no real drying action. It must also be remembered that a stoved ink coating is still capable of accelerating or retarding the drying of the varnish, and very complete stoving is therefore necessary. It may be said generally, however, that with standardised over practice the drying time and temperature depend essentially on the characteristics of the ink. In general, stoving times range from 15 to 25 minutes, and temperatures from 220 to 250°F.

Wolfe indicates that the vehicle for tin-printing inks should consist of a good grade of lithographic varnish to increase the hardness and the adhesion of the inks to the metal. The two examples given below are taken from "Manufacture of Printing and Lithographic Inks" (Wolfe).

TINPRINTING REDDISH BLUE

No. 1 Lithographic varnish	29 lb. 8 oz.
No. 0 „ „	5 „ 0 „
No. 3 „ „	10 „ 8 „
Phospho-tungstic lake of methyl violet, dry	16 „ 8 „
Bronze blue, dry	25 „ 0 „
Alumina hydrate, dry	6 „ 0 „
Paste drier	7 „ 8 „

TINPRINTING MEDIUM YELLOW

No. 1 Transparent varnish	20 lb. 0 oz.
No. 2 „ „	4 „ 12 „
No. 00 „ „	2 „ 0 „
No. 3 „ „	2 „ 8 „
Medium chrome yellow, dry	54 „ 0 „
Gloss white, dry	13 „ 8 „
Alumina hydrate, dry	1 „ 12 „
On last pass over mill add:	
No. 7 Lithographic varnish	1 „ 8 „

A good deal of attention is being directed towards the standardisation of inks and colours. In one American works nineteen standard colours are used (including white and black) which are found to provide sufficient permutations for the most exacting decorative effects.

Process of Protective Painting

PAINTING OF OUTDOOR STEEL

The ivestment in steel structures, such as bridges, trestles, large tanks, etc., is usually of such magnitude that economy dictates a method of protection which is effective against rusting for long periods of time. The most common method of preserving these structure is by means of paint. If the cost of painting is broken down into such factors as cleaning, erection of scaffolds, labour, and paint materials, it will be found that the cost of the paint material itself is of relatively minor importance, probably ranging somewhere between 10 and 25 per cent. of the total cost of application. This obviously makes it desirable to use the best paint materials, inasmuch as economies effected by the use of cheaper finishing materials can effect only a small relative saving. If the life of an outdoor finish can be extended fron four years to five years by the use of a paint of higher quality, this result would justify an increase in the cost of the paint by almost one hundred per cent.

The problem of preservig a complicated steel structure such a bridge can be materially aided by proper design considerations. With faulty design a number of maintenance difficulties may be created. Unless drainage points are provided, rain-water and dust may collect in pockets and greatly shorten the life of the coating at those points. Sharp recesses are difficult to paint, with the attendant danger of having little or no protection given to them. In most cases, such faults of design can be corrected without altering seriously either the strength or the cost of the structure. Attention should also be paid to the facility with which scaffolding for future repainting may be erected. A little more care and attention at the blue-print stage of a structure may pay large dividends in future economy of maintenance.

Probably the most important single factor which determines the life of a protective paint coating on steel structures is the surface preparation of the metal.

It is generally agreed that a thoroughly cleaned surface, that is, one completely free of rust, scale, grease, etc., furnishes the best base material upon which to apply a protective paint. In actual practice, however, this ideal condition can only rarely be obtained and hence the practical problem usually becomes one of striking a suitable compromise.

For new structures, not as yet erected, it may be profitable to consider surface preparation and priming at the steel mill where the structural iron parts are fabricated. At the mill the problem of complete scale removal and controlled application of the inhibitive priming coat is a relatively simple matter. In this connection, a method of mill-priming, recently recommended, is of particular significance. The method of pickling appears to be both economical and efficient. This method makes use of sulphuric acid for removal of the scale followed by a final pickle in phosphoric acid to produce an improved surface for the retained adherence of the paint coating, which is applied to the structural members immediately after pickling while the dry parts are still warm. It is pointed out that such structures primed with a red lead paint, for example, are able to withstand considerable abuse during handling prior to erection. In actual industrial applications, this method of mill-priming has so far given excellent performance records, the adhesion of the priming coat with its attendant absence of corrosion being remarkable. Storage tanks pickled by this process over 5 years ago showed that the priming coats are still elastic and the steel completely free of corrosion, whereas other tanks erected at the same time without a pickling treatment showed definite rusting all over within two years after painting.

The more common practice of preparing a structure for painting is to perform the cleaning operations on the structure after erection. It is here that the difficulty of striking the best compromise on practical cleaning methods is encountered, since both rust and scale should be removed as far as it is economically feasible to do so. The problem of removing rust is not as difficult as that of removing scale, and both mechanical and chemical methods are effective for this purpose. Of chemical methods, the practice of washing with dilute aqueous solutions containing phosphoric acid, alcohol or the water-miscible organic solvents and an inhibitor is finding increasing adoption. Such washes serve to convert the rust to a relatively harmless and well-anchored phosphate. Mechanical methods, such as wire brushing, sandpapering, etc., by hand or machine, and sand or shotblasting, are also effective means of removing rust.

The removal of scale presents a problem of long standing, which as yet has not been completely solved with respect to its economic aspects. The details of several methods of removing scale have been discussed. With respect to the paint problem, the difficulty arises from the fact that partial scale removal is definitely inferior to complete scale removal, but the latter is difficult and costly to realize on erected structures. One method, which has been used to a considerable extent, particularly in the ship-building industry, is to permit the iron and steel surfaces to weather for appreciable period (six months to a year), during which time the scale becomes loosened by under-rusting and is readily removed by wire brushes, hammers and chisels. The problem has been altered from the difficult one of scale removal to the less difficult one of rust removal. Recent studies on improvement of wire brushes hold out promise that this method may become effective in removing even the most adherent scale. At present, the best means of removing scale is to blast

the metal surface with sand, steel shot or steel grit. With the use of sand the necessary precautions must be taken against silicosis, and with steel shot or grit the operation must be designed to conserve the relatively expensive abrasive, limiting the use of this material to descaling of structural parts before erection.

It is difficult to obtain reliable costs of these various cleaning operations. Labour costs, accessibility, amount of scale, etc., all affect the cost and are hardly ever comparable. Recently cost studies have been conducted on the various descaling methods and have shown a surprisingly low relative cost for sand and shotblasting methods. These costs have been computed in terms of cost per square foot.

Computed from data given by Kappler, F., Zeitschrift des Vereines deutscher Ingenieure, 80, 781 (1936).

Descaling processes	A. old pointed steelwork on the site	B. new rusty steelwork in the shop	C. smooth sheets in the shop
Hand brushing	9.5	1.67	0.42
Mechanical brushing	6.4	1.26	0.32
Pneumatic chisel	6.8	2.44	0.97
Sandblasting (hand operated)	4.8	1.03	0.29
Sandblasting (hand operated)	—	1.03	0.29
Sandblasting (mechanical)	—	—	0.32
Sandblasting (mechanical)	—	—	0.32
Shot slinging	—	—	0.39

At present the normal commercial practice of scale removal consists essentially of the removal of surface products which yield to the scrubbing action of a wire brush, usually manually operated. With such incomplete scale removal, the practice of employing a wash containing phosphoric acid and an inhibitor unquestionably aids in reducing the local corrosion potentials set up at the scale-iron boundaries. The further incorporation of a good inhibitive pigment, such as red lead, zinc chromate, etc., in the priming coat, adds a second line of defense against the corrosion hazard introduced by partial removal. It is probably safe to say that at the present time there is still insufficient information to prescribe unequivocal instructions as to the best cleaning practice that might be followed under all practical conditions.

Even with the most effective surface cleaning methods, certain other precautions must be followed if a durable paint coating is to be expected. It is well recognized that paints should be applied only to dry surfaces. Painting either during rain or immediately thereafter is obviously undesirable. Furthermore, in humid, cold climates, painting on any given day is best delayed until the high humidity incident to early morning conditions has subsided. In order to minimize the deleterious effect of thin condensed moisture films, the practice of preheating the work by a blow torch or by burning off a brush coat of organic solvent has been at times resorted to and beneficial results have been reported. Painting at temperatures below 40°F. is generally not recommended. In Germany a special hot spray procedure has been developed which is finding increasing use. This hot spray application is essentially a modern version of the oiled encaustic process and is approximately as follows. A paint vehicle consisting of a thick, highly bodied drying oil mixed with wax and suitable pigments is electrically heated in the cup of a spray gun. The spray is hurled out into a flame which serves the double functions of driving and heating the surface as well as preventing solidification of the spray particles. In this method of application a greater degree of independence from immediate weather conditions is attained. Satisfactory performance of coatings applied in this manner is reported.

Normally, protective paints for metal are applied to structures in situ by brush. This permits a certain amount of working of the priming coats into the incompletely cleaned surface. Relatively inaccessible

regions can be brush-coated which might be partially shielded in a spray application. However, on large and relatively well cleaned surfaces, the use of a spray gun proves both economical and effective. In laboratory studies, no inherent differences have been found in the durability of paint systems applied by brush or spray gun on clean surfaces under controlled conditions.

It is good practice to permit as much time for drying between coats as is economically feasible. In the case of large structures, this is frequently not a difficult objective to meet. Certain weather conditions, such as high winds, accompanied with appreciable quantities of dust, are distinctly deleterious, owing to the embedding of numerous foreign particles in the film. Each of these particles potentially sets up a definite point of weakness. The recent practice of modifying the composition of the paint vehicle in the direction of more rapid drying, so that its susceptibility to weather conditions is reduced, will probably prove important in practice.

For exterior metal protective paints, linseed oil base vehicles are most commonly used. A number of studies have shown that differences in durability, obtained with linseed oil of different sources, are of a negligible order, provided the oil has been sufficiently refined to remove most of the foots and mucilaginous matter. More recently, the question of the comparative value of partially polymerized drying oils, or suitably resin-reinforced linseed oil has been extensively studied, and it is perhaps as yet too early to draw final conclusions as to relative merits of these paint media. In general they appear to offer certain advantages over ordinary linseed oil. As pointed out the benefits conferred by speedier drying or by the development of toughened and less permeable films can be offset by such a sacrifice in long-range durability as to make the more immediate benefits questionable. Future work will undoubtedly aid in clearing up this question.

By way of general guidance, the following paints are suggested for assuring satisfactory performance on steel structures. In making such recommendations it should be kept in mind that no attempt at completeness is intended. Unquestionably, any list of recommended paints for purposes of rust protection is open to criticism for its sins of omission, as well as of commission. With such reservations, priming paints for steel structures containing the following pigments or pigment combinations may be suggesteds red lead, iron oxide containing either about 25 per cent. zinc chromate or 4 to 16 per cent. zinc oxide, and metallic lead pigments. Of these various priming pigments, red lead of the 90 to 95 per cent. Pb_3O_4 grade has enjoyed widest use and the most consistently favourable results. The incorporation of approximately 25 per cent. zinc chromate with either inert or mildly basic pigment combinations also finds wide favour. In such a paint the incorporation of a basic pigment, such as zinc oxide, aids in overcoming its weakness in an acidic environment.

In using these paints, whether for priming or top coats, care should be exercised to utilize a pigment-vehicle ratio which is optimum both for purposes of application and for durability. For top coats a larger number of paints have given satisfactory performance. Typical of these are the following: iron oxide (calcium sulphate-free). Graphite, leaded zinc oxide, micaceous iron oxide, lead titanate and other titanium pigments, white lead, and aluminium powder. Various combinations of these pigments are used both for satisfying appearance requirements and for improving durability. From the standpoint of protection, the chief purpose of a top coat is to protect the priming coat for the longest possible time.

With regard to the maintenance of

paint coatings, it is generally agreed that the most economical practice is to repaint before the priming coats are dangerously attacked, inasmuch as the expensive problem of reconditioning rusted areas is thus avoided. Many of the large companies have adopted the practice of frequent inspection of their painted structures, and an experienced inspector can usually tell without much difficulty when repainting is advisable. The frequency at which such structures must be repainted varies considerably,• depending on a number of factors, such as the quality of the previous painting and the severity of exposure. In general, it may be said that actual paint applications on structures do not show the life promised by panel exposure tests with the same paints. Four to six-year life on inland rural exposures at latitudes above 40 degrees may be considered as good average performance for the three-coat application. In industrial areas this normal life expectancy may be shortened to about 3 to 5 years. In coastal rigions a life of 3 to 6 years may be expected, depending on the proximity to additional pollution from industrial regions. It must be clearly reorganized that such life expectancies carry large elements of chance owing to the many factors involved. Unquestionably, unusual records of individual experiences can be cited in which a performance life considerably beyond these limits is found. is safe to predict that, as a consequence of the many paint studies currently engaged in, the average life of actual practical paint jobs will be considerably extended in the future.

PAINTING OF INDUSTRIAL EQUIPMENT

The problem of finishing industrial equipment is in several respects quite unlike that of painting large immobile structures, exposed either to the atmosphere or burried in the ground. Both the type of finishing materials used and their method of application is essentially different. The organic coatings designed fo[illegible] equipment, in addition to offering corros[illegible] protection for the underlying metal, usually must meet definite appearance requirements, both initially and for protracte[illegible] [illegible]eriods of time, and must offer considera[illegible] resistance to mechanical stresses o[illegible] [illegible]arious kinds. Consequently, the enamel types of coating, e.g., a nitrocellulose has, a baking varnish or an oil-modified synthetic resin, find almost exclusive use for painting equipment, such as automobiles, electrical apparatus, office equipment, cash registers, household refrigerators, etc.

Such equipment is finished indoors under modern, high-speed manufacturing conditions. Wherever feasible, that is, where production schedules are sufficiently high, the various steps used in applying these finishes, such as cleaning, surface treatment, application of the coating, drying or baking, are placed on a mechanical basis. To make this possible, conversion of the finishing medium to a hard, tough coating must be rapid; consequently the exterior type of paint coating finds practically no application, since it dries much too slowly and offers insufficient resistence to the mechanical abuse incident to assembly and transport of such equipment.

The procedure used in finishing different types of equipment requires methods that may vary considerably, depending on the kind of metal used, its history of fabrication up to the point of finishing, and the kind of organic protection desired from the standpoint of of serviceability and life. In general, the finishing operations are brought to a high order of control and the importance of thorough preparation of the metal surface before painting is fully realized and acted on. By way of illustration, the current finishing practices used in the manufacture of two entirely unrelated items of equipment, namely telephone handset bases and

passenger automobiles, are described in some detail.

Telephone handset bases, are at present die-cast from a zinc alloy and are finished with a black synthetic resin type of baking varnish, which is formulated to match the appearance of the phenol-plastic handset associated with it. The organic finish must protect the underlying metal against corrosion and maintain a sightly appearance for many years of service. The operations involved in the production of this high quality are approximately as follows.

The die-cast bases are placed in the carriers of an automatic solvent vapour degreasing machine to remove residual oil from machining operations. The parts are then placed on a overhead monorail conveyor which delivers them to the loading end of a straightline grit blasting machine. Steel grit is used instead of sand, as it produces a more suitable surface for the enamel coats and simultaneously eliminates the silicosis hazard. At the discharge end of this specially-designed blasting machine, excess steel grit is removed by the use of compressed air. Some sorting of parts may be necessary at this point for filling of casting imperfections, the filled parts being subjected to a short baking operation in which automatic conveyors are used and the excess filler is sanded smooth. All parts, filled or unfilled, are brushed thoroughly to remove grit and dirt, hung on another overhead monorail conveyor and delivered to the racking bench.

At this point the bases are placed on specially designed spray fixtures and placed on the carriers of a conveyor type oven which transports them to the spray room. This room is equipped with centrifugal type water-washed spray booths, the water-wash minimizing the work of cleaning the booths and reducing fire hazards, inasmuch as all paint residues are washed down, emulsified, and collected in sludge tanks outside the booth. Fresh air is supplied at a slight outward pressure to this enclosed spray room through a self-cleaning oiled-curtain type of air filter. Spraying is performed manually and each operator is equipped with a spray gun supplied with uniform air and paint distribution system located in a special fire-proof room. The sprayed work is then transported by carriers on a continuous chain conveyor through a baking oven, heated by an indirect gasfired heating system, the air in the oven being filtered. The bake ovens are equipped with accurate temperature control and regulating devices and for precaution against fire an automatic carbon dioxide fire extinguishing system is provided. After receiving two coats of enamel, each of which is baked for one hour at at 350°F., the finished parts are inspected for appearance and conformance to rigid standards, as required in process specifications.

A finish such as this is able to resist severe mechanical abuse without separating from the base metal, and it satisfactorily withstands exposure outdoors or in high humidity for a period of several years. The absence of a corrosion-inhibitive priming coat is in marked contrast to the practice of finishing metals designed for outdoor exposure. The high quality of such a finish is attributable to a combination of factors such as careful selection of the finishing medium, through surface cleaning and preparation, and a high degree of control of the spraying and baking operations.

The finishes of passenger automobiles have been brought to a very high level of quality during the last few years. Owing to large production schedules, practically every step in the sequence of finishing operations has been placed on a conveyorized basis and the element of time constitutes perhaps the most important economic factor. Before the advent of

nitrocellulose lacquers, the finishing of an automobile was an operation consuming several weeks; and unfortunately the time required in service for unsightly surface cracks to appear was also a matter of weeks. At present finishing schedules are figured in terms of hours and service in years. In fact an eligible finishing material for this industry is considered unsatisfactory, if within two years' exposure to the sun. test panels should chalk to a point where the original gloss cannot be readily restored by a polishing operation.

At present, two general methods of finishing passenger vehicles are in use. One consists of a system in which the colour coats consist of baked oil-modified synthetic resin enamels. The following is a schedule of the process steps involved in the finishing of automobiles in which nitrocellulose enamels are employed:—

CLEANING.—A preliminary air blast is used for removing gross dirt, filings, loose solder drips, etc. The body is next washed off with a hotwater solution containing both alcohol and phosphoric acid to remove superficial rust and oil films. It is next scurbbed with petroleum spirits by means of brushes. This is followed by a hotwater rince. At times susceptible areas, where moisture may become entrapped, are given quick phosphate treatment for local rust-preventing purposes. Recently, some of the manufacturers have adopted the practice of phosphating the entire body to obtain improved adherence of the finish. The body is then dried in a hoe oven and blown off with air at points where water may have collected. Immediately before the application of a sprayed coating, the entire body is rubbed off with special rags, impregnated with a resin medium in a taky stage, for the purpose of picking up chance dust particles. This operation is called "tack-ragging."

PRIMING.—The priming coat is now sprayed on. Usually an oil base material, containing iron oxide as the principal pigment, is used. Great care is exercised in the spray booths used in the automobile plants to prevent dust from falling on the surface. The air in the booths is filtered and maintained at a slight outward pressure to prevent dust from being sucked in. In addition, the walls of the spray booths are coated with a dust-trapping film frequently consisting of a sticky medium such as castor oil. Large volumes of air are employed and the suction is usually applied at the floor level, owing to the greater density of the vapours released.

The priming coat is then baked about one hour at approximately 200°F. After this, a surfacer coat is applied which is similar in composition to the priming coat, except that somewhat more pigment is incorporated in the vehicle to facilitate ease of sanding. This surfacer coat receives a bake similar to that of the priming coat. The combined primer and surfacer are then sanded. For the automobile industry, special sandpapers have been developed to permit rapid sanding under a constant stream of water. This sanding operation is usually conducted by hand, although for certain areas on the body special machines have been developed.

After sanding, local imperfections, such as dents, mars, deep scratches, etc., are filled with what is called a glazing putty, usually of a pyroxylin base. This dries quickly and is sanded off locally to conform to the rest of the surface.

FINISH COATS.—Two coats of the appropriated coloured pyroxylin enamel are then sprayed on and given a short dry to expedite escape of solvent (5 minutes at 150°F). This is followed by two more spray coats, and the entire system is then dried for approximately 20 minutes at 180°F. The last coat is subjected to a final polishing operation. This is usually done by means of a power-driven rotating disc of lamb's wool and a polishing abrasive, consisting usually of a mixture of a finely

divided soft abrasive, such as rotten stone, in a waxy vehicle.

SHEET-METAL WORK

The sheet metal parts, such as hoods, fenders, running boards, gas tank, covers, etc., are treated slightly differently. In most automobile plants the cleaning and surface preparation of these parts is performed on automatic conveyors as follows: Dip in boiling hot dilute alkali cleaner for grease removal, followed by thorough rinsing in hot water, This is followed by a rapid phosphating treatment either in dip tanks or in spray booths. Usually such a treatment is followed by a dip in a hot-water solution containing a small amount of chromic acid for additional inhibitive purposes. This last dip is allowed to dry in suitable ovens without further rinsing.

For black fenders, black Japan is applied by dipping and is then baked for 30 minutes at 450°F., and then followed by a second dip and a similar bake. For coloured fenders, defective black japanned fenders may be sanded, after which the pyroxylin colour coat is applied. In other cases, an oil type primer baked at 300 to 350°F. for 30 minutes may be used; this is then sanded and followed by 2 or 3 coats of the pyroxylin colour enamel. On hoods and other sheet-metal parts, baking gray primers followed by lacquers are frequently used.

When baked synthetic resin-varnish finishes are used for top coats, the process leading up to the top coats is essentially the same. Owing to the greater solids content of these enamels as compared with nitrocellulose enamels, two coats of these baking materials usually give a film thickness equivalent to that obtained with four coats of nitrocellulose enamels. After the priming and surfacing coats, the first colour coat is sprayed on, and is then baked usually for about one hour at approximately 250°F., or for a shorter period of time at a somewhat higher temperature. This coat is then wet-sanded, dried and tack-ragged, after which the second and final colour coat is applied and given a similar baking treatment.

With the use of these baked synthetic finishes, more care must be exercised to prevent local marring of the finish, owing to the greater difficulty of repairing such defects. The Ford Company has developed a rather novel method of making these local repairs. In the neighbourhood of a scratch the finish is lightly sanded to promote the adherence of the sprayed repair patch, which is baked by the use of specially designed lamps. A lamp of the carbon-filament type, normally used for therapeutic purposes, is fitted with a gold-surfaced reflector and is held approximately 12 to 20 inches away from the surface; the finish is baked in a matter of minutes. The method of baking is now used extensively at the Ford River Rouge plant for other operations in addition to repair work. For instance, the priming coat is baked in a novel arrangement in which the conveyorized body is surrounded by a clam-shell arrangement on which a large number of these lamps are suitably placed. The two halves of the clam-shell ride parallel to the body for a period of about seven minutes, after which they are returned to surround another body coming along on the conveyor. It is stated that this seven-minute bake is approximately equivalent to the usual one-hour bake. Similar tunnel ovens employing these carbon lamps are used for drying off rinse water before baking and other heating operations.

In the use of either nitrocellulose or synthetic resin enamels, care is exercised in the proper balance of the solvents, so that a high-gloss, well-knit film is at all times produced. Considerable development has been necessary in the selection of optimum pigment combinations and the difficult problem of colour matching between parts finished at different points in the factory has been successfully overcome.

There is a difference of opinion as to whether the synthetic resin type of enamel is superior to the nitrocellulose enamel. Advances have been made in both classes of materials and it may be said that each class, when properly formulated and applied, yields finishes with remarkable performance records indeed. It may be of interest to know that the finishing schedules of low and high priced cars are practically the same. Essentially, the difference between them lies in the closer attention paid to perfection of finish appearance in the more expensive cars. The additional rubbing, polishing and inspecting required to produce this order of perfection is relatively expensive, but adds little of intrinsic value to the serviceability and life of the finish.

PROTECTION OF UNDERGROUND PIPE

From a technical standpoint the problem of protecting underground pipe against corrosion is in many respects dissimilar to that encountered in the protection of iron and steel atmospheric corrosion. There is first of all the consideration of the type of underground pipe distribution system, that is, whether it is a low-pressure gas or water system, or a trunk-line system carrying gas or oil at high pressures over long distances. The methods of protecting the two kinds of systems are different in a number of respects. There is the question of the physical and chemical constitution of the soil in which the pipe system is burried. In most instances these soil factors are of more importance in controlling corrosion of pipes than the particular kind of ferrous metal of which a pipe is made. This requires, particularly in the case of long pipe lines, a thorough knowledge of the soil, for it is found that in some soils no protection of the pipe may be needed, whereas in other highly-corrosive soils, the best protection available is indispensable. As a rule, pipe buried in the ground requires protection against corrosion, and the coatings employed for this purpose are usually very much thicker than the organic coatings used for atmospheric exposure. Such coatings must also be able to resist stresses of various kinds, such as impact during the laying of the pipe and the long-time soil stresses associated with changes in water content and motion of the soil. More recently the practice of cathodic protection to buried pipe is coming into increasing use, both as a means of protection against stray electrical currents produced by external electric fields, and currents due to the operation of galvanic cells on the pipe itself. This is accomplished by raising the potential of the surrounding earth by means of a storage battery, D. C. power supply, or by the use of a highly electronegative metal such as zinc. The usual arrangement is to bury a metal electrode in the soil at a certain distance from the pipe to be protected and to attach the positive pole of the battery or the power lead to this metal. When zinc is employed, it may be used in the form of bars or wire; in the latter case it may be buried in parallel with the pipe and attached by an insulated lead to the pipe at quitable distances. The current required to prevent corrosion of coated pipes (at defects in the coating) is usually much less than that necessary to protect bare pipe. It has been used most successfully on single pipe lines in areas in which other pipe lines are not involved.

The importance of variations in the soil depends to a large extent on the kind of pipe line to be buried. Thus, in the case of long lines extending over several hundred miles, in which there is a considerable economic stake involved, it has become customary to survey the terrain in which such a pipe is to be laid. The experienced soil expert is thus enabled many times to avoid or warn against dangerous stretches such as river crossings, local swamps, etc., and in many instances, such

"hot spots" can be avoided without additional expense.

A technology of soil testing has been developed in which a number of factors are examined for their relation to the corrosiveness of the soil. Such soil test methods have not always been completely successful owing to the many variables involved. It is customary to determine the pH value of soil extracts, the conductivity of the soils, and the nature of the electrolytes furnishing the ions for this conductivity. In addition to these factors, the relative ease with which the electrolytes, as well as gases, can migrate in the soil is important, and this depends to a large extent on the texture of the soil, that is, the size and distribution of the soil particles. Several of the larger pipe users keep complete records of failures, which are charted on suitable maps. By this means, in the course of years a reliable picture of the relative corrosiveness of soils in various parts of an area is obtained and proper action with respect to the laying of new pipe or pipe replacements is made possible.

Hundreds of different coating materials have been tried at various times as a means of minimizing the corrosion of buried pipe. Paints of many kinds, lacquers, bituminous materials of either asphaltic or coal tar origin, metallic coatings, vitreous enamels, greases cements may be mentioned. Of these, not one has given perfect protection in all soils, and yet unquestionably the better ones have served to prolong the life of pipe lines for many years in corrosive locations. The type of coating to be selected is to a large extent dependent on the type of pipe line to be protected. In the case of urban pipe systems, which are usually made up of a considerable network of relatively small pipe, it is generally considered more economical to buy protection in the form of heavier pipe wall section, such as the typical cast-iron pipe. In a city water or gas system, the number of connections to be made, the frequencyy of digging up trenches,* and the use of low pressures have usually dictated the use of pipe. In long trunk pipe lines, however, it is customary to use steel pipes, owing to the greater pressures involved, and the high cost of transporting heavy wall, large diameter pipe. It is in this class of pipe lines where the greatest advance in the technology of pipe coatings has been made within the last ten years.

It is a matter of considerable difficulty at the present state of development to attempt to set up specifications which would insure a definite pipe life. The variables that enter are numerous, and standardization, as well as control, of practices, particularly in the field of protective coatings, is in need of further development. There are, however, certain important facts concerning pipe coatings which are generally agreed upon at present. For instance, thin coats of the type of paint used for atmospheric protection are unsatisfactory for underground pipe coatings. They do not have sufficient mechanical resistance to withstand the treatment to which the pipes are subjected before, during and after installation. Although rust inhibiting pigments in such paint coatings offer a measure of defence at the metal surface, they cannot be relied upon without appreciable further reinforcement to withstand the impact stresses during back filling and the subsequent soil stresses. In this connection it would be of interest to experiment with modern baked synthetic types of coating, inasmuch as these offer an attractive combination of moisture impermeability, inhibitive protection in the priming coat, and a high level of mechanical resistance. A minimum 2-coat, or preferably a 3-coat application at the mill in suitable conveyorized mechanisms should make the cost of such protection competitive with other means of protection.

It is generally agreed that thick coatings are desirable. These usually involve a multiple application of the coating medium which automatically minimizes the probability of continuous imperfections through the protective material. Also it helps to decrease the permeability and to delay the effects of soil stresses. These soil stresses are of several kinds. There is the immediate impact of stones and agglomerations during the back-fill operation. Then there is the gradual and variable settling of the back-fill soon after burial of the pipe, and finally there is the swelling and shrinking of the soil as it picks up and loses water. This latter is particularly noticeable in finely dispersed colloidal types of clays in which the swelling pressures at times becomes quite large.

Owing to these soil stresses, it has been found that reinforcing or shielding of the organic coatings is necessary in most soils. Many methods of improving the mechanical resistance of coatings, particularly those of a bituminous nature, have been tried. Usually the coal tar or asphalt enamels, which are at present the most widely used pipe coating materials, are compounded with the proper quantity of finely dispersed mineral fillers in order to enhance the mechanical resistance of the bituminous coating. Another method of protecting the organic coating against soil stresses consists of the use of strong wrappings between layers and on top of the coatings. A large number of materials have been tried for this purpose, such as cloths of various types, e.g., hessian, burlap, etc., metallic foils, cellulosic foils, and impregnated asbestos fabrics or sheetings. Many of the organic fabrics have been found to rot in a number of soils owing to bacterial attack. However, thorough impregnation with a coating medium to a large extent overcomes this defect. In the opinion of many, the asbestos type of shield has given the best performance record, being both mechanically tough and durable.

Of the bituminous coatings, air-blown asphalts obtained from asphaltic crude oils and the coal tars are enjoying the widest use. Although there is some difference of opinion as to the relative merits of these two materials, both of them give good service if properly applied in sufficient thickness. They are by-products of the oil and coke industries, respectively, and hence the care used in their chemical control is not as great as that exercised in the manufacture of paints. Instead, these materials are usually processed to meet specified physical requirements, such as penetration tests, ring and ball softening points, and other empirical deformation tests. As a rule, the coal tars show a narrow range of temperature, beyond the limits of which they become too soft to stay in place or too brittle to resist impact. The addition of fillers and suitable plasticizers has extended this temperature range. The air-blown asphalts, as a class, show a greater temperature insensitivity, but on the other hand are more permeable to moisture than coal-tar coatings. In addition to the bituminous coatings, other materials are also used for specific purposes. Among these are the concrete coatings, grease coatings containing inhibiting chromates, and rubber coatings.

Perhaps the most significant development in the pipe coating field during the past few years has been the improvement in methods of applying the protective coatings. It has been recognized that the proper aim in these developments is toward the perfect coating, that is, one which is completely free of pinholes of "holiday," i.e., missed spots; is adherent to every part of the pipe surface; and is capable of excluding moisture and resisting soil stresses. To make such a coating possible, close control and means of testing of every step in the coating process is necessary.

The art has at present developed to a point where one company has considered it safe practice to reduce the wall thickness of its steel pipe and thereby actually effect a net saving even though an improved coating is applied.

Two general methods of applying protective coatings to pipe are now being practised. One consists of applying the coatings at the pipe factory and shipping the coated pipe to the point of installation, and the other consists in applying the coatings in the field. In either case the control of process operations has been brought to a high order. The materials used for the coatings are carefully selected. Laboratory tests are made on test panels of eligible materials for such properties as sagging at moderately high temperatures, embrittlement at low temperature, cold flow over long periods, permeability to moisture, and behavior during heating, that is, changes in viscosity and composition. In addition, control tests are used to make sure that subsequent shipments of an accepted coating material are up to standard. Such identification tests as melting point determinations, needle penetrations, and viscosity tests serve for this purpose. During application the heating of the bituminous enamels is carefully regulated as temperatures which are too low prevent adequate flow of the coating material and temperatures which are too high, particularly if maintained, bring about thin coatings, as well as excessive and harmful decomposition. It is customary to specify a maximum time at top temperatures, beyond which the material must be discarded.

Following is a typical modern factory-applied pipe coating of good quality: The bare pipe is carefully cleaned, moisture, grease, dirt, etc., being removed. The pipe is then fed into a priming machine, where a thin coat of unfilled bitumen, either of asphaltic or coal-tar nature, is applied cold in solution form. This is necessary to obtain adhesion of the hot enamel coat, cold pipe without thoroughly bonding to it. After the primer has dried, a thick hot coating of enamel, again either of blown-asphalt or coal tar, is flowed over the rotating and forward-moving pipe, which is then immediately served with a spiral and partially over-lapping wrap for mechanical protection of the enamel. Impregnated asbestos felt has been found to be an excellent material for this purpose. A second hot coating of enamel, again followed by a wrap with asbestos felt, is usually applied for high-grade coatings. The final wrapping usually consists of kraft paper, applied immediately after the felt wrapping. This serves to maintain the rotating at a lower temperature on direct exposure to the sun and to reveal damage to the coating in the course of shipment. One of the features of the development of these new pipe coatings is the special mechanical equipment needed for the rapid method of application. There is some variation in different commercial coatings both in the materials used and in the number of coats applied. The coating is finally tested for continuity and thickness. Continuity is usually determined by subjecting the entire surface area of the coating to a spark test at a voltage ranging from 5,000 to 30,000 volts and the thickness is tested by the weight of the coating on definite lengths of the pipe depending on the number of coats applied and the pipe size their thickness ranges from 1/32 to approximately ½ inch.

Larger pipe sizes are frequently coated in the field with the use of similar machinery. For reconditioning used pipe in the field special machines employing rotating knives, scrapers, and brushes have been developed to remove rust, scale, and incrustations. Pits are filled by welding and the cleaned surface is coated by processes similar to those described for factory applied coatings. One large company has developed a coating composition

consisting of a mastic of asphalt and small gravel, properly proportioned to produce a thick-like coating of high strength. This coating is directly extruded on the pipe as it passes under a hopper. With some of these field applications as much as two miles of pipe can be coated in one day with an experienced crew. Within the past few years it has become fully realized that care must be exercised in the manipulati and laying of coated pipe. Padded ski and slings are being used and the bac fill is deposited as gently as possibl Although life data on these newer coatin and practices are not as yet available th expectation is that considerably improve performances over coating applied accord ing to previous methods will be obtained

Plants that Catch More Sunlight

By Eric Ashby

With world population increasing steadily, scientists are working to assure that food supplies also will improve: better farming practices and the development of more efficient plants should help productivity.

Before long, the total world population will reach some 2,500,000,000. On the gloomy assumption that a century from now the world population will be double this amount, could there conceivably be enough food in the world for 5,000,0000,000 people? Is the world's energy income enough to supply all this food?

The physiologist measures energy in calories. An active man uses up about 2,500 calories in a day. Children and old people use fewer calories, and millions of people who do need the full amount are having to do with half that amount. But in making an energy balance sheet for man we should not underestimate the need, so let us take it at 2,500 calories per day. This is the energy a man uses—the energy which has to be replaced by food.

When we calculate the maximum daily expenditure of energy by a world population of 5,000,000,000, we get a figure the mind cannot easily grasp twelve and a half trillion calories per day. This is the amount of energy in something over 3,000,000 tons of sugar. So, if the agriculture of the future is to feed double th present population of the earth, this is th amount of sugar, or equivalent amounts o starch or fat or animal protein, which th world's crops must provide per day Otherwise some of the human race wi starve.

Ultimately all of this energy come from green plants. But how do plant themselves acquire the energy? It is n exaggeration to say that this is the mos important unsolved problem of botany, fo if it were solved we would know how sugar is made with energy from the sur For that is what happens. Hold out you hand to the sun, and you realise that mos of its energy as it falls on your hand i dissipated as heat. But put a green lea in the sun, and its chlorophyll absorbs th energy and holds some of it as chemica energy.

This energy captured from the sun used to remove hydrogen atoms fro water in the leaf and to attach them t carbon-dioxide gas which enters the lea from the atmosphere. This process c shifting hydrogen from one substance t another is called photosynthesis an results in the storage of solar energy i chemical form. The commonest chemica form is sugar. Probably more researc has been done on this synthesis than o

any other problem in plant physiology and, although it is theoretically possible to imitate it, no chemist has yet succeeded in doing so. Indeed, it is only very recently, by the use of radioactive isotopes, that the parts played by carbon dioxide and water have been discovered.

The process is, in fact, far more complex than the dramatic kinds of synthesis achieved by industrial chemists with plastics and the like, and it is not surprising that it has so far baffled all attempts to understand it. Even if we do not fully understand photosynthesis—the making of sugar with energy from the sun—we know a good deal about the efficiency of the process as an accumulator of energy.

Most of the sun's energy is irretrievably lost to us. More than half of it does not penetrate the atmosphere at all. Of the solar energy which does reach the earth, much does not fall on plants, and so is lost. And most of the proportion that does fall on plants is not absorbed as chemical energy, but passes through the leaves, as reflected from their surface, or is transformed into heat. It has been estimated that no more than two per cent. of the solar energy falling on vegetation is converted into chemical energy and stored in the plant. How can we recover some of the lost 98 per cent. of sunshine?

First, let us determine how much solar energy is fixed by plants on land and in the oceans, every day. Calculations based on the most recent information produce a dramatic result: if two per cent. of the solar energy falling on vegetation of all kinds, edible and inedible, is converted to stored energy in plants, this produces an energy income about 1,000 times the energy consumption of mankind in a world with double the present population.

This may seem an ample excess, but there are vast areas of the earth's surface which, though they carry vegetation, could not conceivably carry any crop plants as we know them to-day. In fact only a few million acres of the earth's surface are considered to be climatically suitable for crop plants, and over a third of this acreage is being cultivated already. This few million acres of land suitable for crops includes what are at present forests and jungles and scrub, which have not yet been made productive.

Out of this energy income all the animals have to be fed, too. Indeed, it is a narrow margin: the possibility that man might not be able to balance his energy budget, if the world population greatly increases, is very real. We have to admit that crops, working at their present efficiency level on all the land we now believe to be capable of cultivation, might barely secure enough energy from the sun to supply daily bread for our great-grandchildren.

Yet the solar energy is there, but 98 per cent. which is absorbed by the atmosphere and never reaches the surface of the earth at all. We must be content to try to harness a greater proportion of that fraction of the sun's energy which already falls on vegetation, on land and sea. This fraction alone of the sun's energy should be enough to serve our needs. It is over 100,000 times more than the world would need, even if the world had double its present population. So the major problem can now be focussed in two questions: is it possible to increase the efficiency with which plants intercept and store solar energy? And if so, how?

The first is easy to answer. If you look through the statistics for yields of wheat or potatoes or corn you find that maximum yields under favourable conditions are sometimes as much as 20 times greater than average yields. So there is clearly a case for improving the average. What are the obstacles?

First among the obstacles I would put poor farming. You have only to look at the fields in places where agriculture is underdeveloped to see that half the sun-

light is not falling on the crop at all, but on the bare soil, or on weeds which cannot be used for food.

Perhaps I should explain what the plant physiologist means by poor farming. He does not regard it from the farmer's point of view, in terms of hoeing, or weeding, or watering, but rather from the plant's point of view. The leaves must be displayed to the sun to enable the maximum amount of light to be absorbed. The roots must live in a soil where there is ample air for their respiration (that is why a water-logged soil is bad), and where there is a healthy population of micro-organisms to break down manure and other organic materials into simple chemicals which the roots can absorb.

The individual plants must not be so close together that their roots are competing for nutrients and water, yet not so far apart that sunlight is falling between them on the ban soil. And there must be a water table sufficiently high to provide a stream of water through the plant all day, for if the water supply fails even for an hour at midday, sugar production in the leaves mav be halved.

One of the chief needs on under-developed farms is fertiliser. Even in the United States fertiliser consumption has almost trebled in the last 10 years and yieds have risen correspondingly.

Some figures recently published for corn in the State of North Carolina show what can be done by the simple application of better farming. Before 1900, the average yield of corn in North Carolina was no more than 14 bushels per acre. In the 1920's an intensive educational programme for better farming, without any scientific innovations at all, brought the yields up from 14 to 20 bushels per acre.

In 1943 there was a compaign for more intensive nitrogen manuring and still better farming, and the State set itself a goal of 40 bushels per acre by 1955. This in an increase of 180 per cent. in crop efficiency over about half a century. And in 1953 the farmers of North Carolina were already within sight of their goal.

So the first obstacle to higher efficiency in crops can be overcome simply by education; it does not need research. The second obstacle is disease and pests. If you have ever seen a potato field infested by blight, or locusts on the plains of India, you need no convincing that the productivity of crops is worked by the pests.

Then there are the obstacles to higher productivity inherent in the crops themselves. Is there any prospect that plant physiologists can make the process of photosynthesis itself more efficient? My own guess is that plant physiologists will not, for some time to come, be able to accelerate the reaction itself; they are not yet familiar even with the steps by which it occurs. But they can do a great deal indirectly to improve the efficiency of a crop.

Any treatment which increases the area of leaves exposed to the sun will increase the productivity per plant. So will any treatment which increases the thickness of the leaves so that they intercept more light. So will any treatment which produces deep, instead of spreading, roots, for then the plants can be grown closer together.

In brief, the plant physiologist can discover new patterns of crops designed to intercept the maximum amount of sunlight. To mention one example: a variety of cotton which produces long branches throw the lower leaves of the plant well outside the shade of the upper leaves. In one case, at least, this has been proved to increase yield.

Another contribution the physiologist makes is to study how crops maintain their efficiency in unfavourable conditions: during droughts, or cold or dull weather. These are problems to which Russian and

Canadian workers have made important contributions. Russian plant physiologists, for instance, have discovered a good deal about drought resistance, and Canadian workers have paid particular attention to frost resistance. Farmers using their results have pushed the agricultural frontier of Canada many miles nearer the Arctic.

Finally, the plant breeder has a contribution to make. He can select varieties of crops on a basis of their energy, and can even breed deliberately for large leaves, and for a high efficiency in utilising sunlight. For example: by hybridizing inbred varieties of corn it is possible to produce strains which, because of their greater size and vigour, intercept and store much more solar energy than the parent strains from which they came.

Twenty years ago these hybrid strains were scarcely to be seen at all in the corn belt of America. To-day, over four-fifths of the corn in those states comes from hybrid strains. Other conditions of cultivation have not changed much, yet the yields from the corn belt have gone up by 500,000,000 bushels a year. That is an increase in crop efficiency of 25 per cent. in 20 years.

Just as the speed of an airplane can be improved by introducing a new wing shape, so the yield of a crop plant can be improved by introducing new patterns of leaves and branches and roots. The use of hybrid corn has virtually provided enough additional livestock feed to give every man, woman, and child in the United States another 50 pounds of meat a year. This demonstrates that the benefits of research for plenty are not only for our grandchildren.

—SCIENCE DIGEST.

British Trade with India and Pakistan During January to June 1953

INDO-BRITISH TRADE

India's tea exports to Britain in June this year were again above the figures for the same month of the past two years, and amounted to 9,274,000 lb., the total for the half-year being 125,415,000 lb. valued at £18,768,000. In the first six months of this year India was the largest supplier of tea to Britain, whose tea imports for the period totalled 215,806,000 lb. worth £34,610,000.

In leather, too, India was by far Britain's largest supplier. She sent to the U. K. leather worth £1,452,000 in June (four times as much as in the same month of last year) and to the value of £7,240,000 in the first six months of this year (nearly twice as much as in the same period of 1952). Britain's total leather imports during the half-year were valued at £10,033,000.

During the six months to the end of June, India supplied well over two-thirds of Britain's total imports of manufacturers of textile materials other than cotton, silk or wool, sending £876,000 worth of coir mats and matting, jute piece-goods to the value of £2,119,000, and jute sacks and bags costing £1,129,000. The total value of manufactures of textile materials in this category sent by India in the six-month period was £4,606,000.

Raw and waste wool exported by India to Britain in June amounted to

1,969,000 lb., bringing the total for the six months to 11,359,000 lb. valued at £2,465,000 — an increase of more than one-third over the first half of last year. This year's six-month figure was made up mostly of sheep's and lamb's wool — 10,966,000 lb. costing £2,424,000.

MORE COTTON EXPORTED

U. K. imports of Indian raw cotton and waste during the first half of this year were nearly three times as great as in the corresponding period of 1952; the June imports, worth £291,000, brought the total for the half-year to £1,765,000. These imports included 7,801 tons of unmanufactured cotton waste (of which India was the largest single supplier) priced at £1,192,000. During the six months India provided over one-quarter of Britain's imports of raw cotton of 7/8 inch staple and under—5,800,000 lb, to the value of £548,000 compared with £56-worth in the first of 1952

Second only to the U. S. A. as Britain's largest source of tobacco, India sent her in the first six months of this year 13,450,000 lb. of tobacco valued at £2,765,000. During the half-year India was by far Britain's largest supplier of unmanufactured stripped tobacco, providing 9,542,000 lb. of the commodity to the value of £2,223,000. Britain also took 3,908,000 lb. of unmanufactured unstripped tobacco for which she paid £542,000.

Non-ferrous metalliferous ores and scrap supplied to the U. K. by India in June were valued at £179,000—more than twice the amount sent in the same month last year—and brought the half-yearly total to £1,723,000. The bulk of this was made up by manganese ore, of which India provided about one-third of Britain's imports in the six months, sending 85,501 tons valued at £1,352,000.

Of Britain's world exports of machinery in the first half of the year (476,512 tons valued at £205,301,000) the second largest amount was taken by India—44,785 tons to the value of £17,566,000. India was still Britain's leading customer for textile machinery, taking in the six months 8,550 tons valued at £3,818,000—nearly one-fifth of Britain's total exports of such machinery.

ELECTRICAL MACHINERY

Electrical machinery was another important item in India's imports from U. K. in the first six month of this year India took, 1,544 tons of generaeing sets and generators worth £992,000; 923 tons of motors and parts valued at £430,000; and 5,181 tons of other electrical machinery costing £2,479,000 and representing an increase of about one-quarter over the figure for the same period of last year.

Again the largest single customer for British mechanical handling equipment, India took 490 tons in June, bringing the total for the half-year to 2,665 tons (worth £709,000), an increase of one-half on the first six months of 1952. An increase of the same order was also recorded for metal-working machine tools, of which India imported from the U. K. 2,598 tons to the value of £1,012,000 in the half-year.

Other notable imports of British machinery in India during the first half of this year included boilers and boiler-house plant (worth £899,000); pumps (£ 452,000); printing and book-binding machinery (£342,000), compressors (£ 310,000); internal combustion engines (£267,000); industrial valves (£258,000); and machinery belting (£263,000).

Both in June and in the first six months of this year India was the most important customer for British-made electrical goods and apparatus, her purchases being valued at £1,066,000 and £6,304,000 respectively. Under this head the largest item was made up of insulated cable, wires, strips and strands, India taking in the half-year 11,599 tons worth £3,475,000—

about half as much again as in the same period of 1952.

June saw another notable increase in India's imports of British telephone, telegraph and broadcasting apparatus: the June imports totalling £188,000 in value compared with £77,000 in the same month last year. The figure for the half-year was £1,182,000 against £742,000 in the same period of 1952.

VEHICLE IMPORTS

In the first six months of this year India imported from the U. K. £7,464,000 worth of vehicles and parts. These imports included 66 locomotives (valued at £851,000); 2,546 tons of locomotive parts (£781,000) and 3,832 tons of axles, tyres and wheels for rail vehicles (£406,000); 1,940 cars (£572,000); 268 agricultural tractors (£97,000); 208 commercial vehicles (£152,000); 490 chassis other than cars (£369,000); 1,152 motor-cycles (£ 150,000); 53,734 cycles (£406,000); and 937 tons of cycle parts (£345,000).

Other leading items in India's imports from the U. K. during the first half of this year included chemicals, drugs, dyes and colours worth £3,778,000; woollen and worsted yarns and manufactures (£ 2,891,000); miscellaneous articles wholly or mainly manufactured (£2,746,000); and manufactured oils, fats and resins (£ 2,128,000).

The latest figures for overall trade given in the U. K. Trade and Navigation Accounts show that during the first six months of this year India's exports to Britain were valued at £51,075,000 and her imports from Britain at £55,089,000.

U. K. TRADE WITH PAKISTAN

Pakistan's imports of British textile machinery in June 1953 were nearly twice as great as in June last year—1,439 tons valued at £515,000. This brought the total for the first six months of this year to 5,208 tons valued at £1,813,000 against shipments worth £1,529,000 in the first half of last year and £856,000 worth in the same period of 1951. Second only to India as the best customer for this type of plant up to the end of June, Pakistan took more than one-ninth of Britain's total world exports.

Textile machinery accounted for nearly half of Pakistan's imports of British machinery in the first half of this year, which amounted to 10,565 tons worth £3,805,000. This included 65 tons of generating sets and generators valued at £35,000; 219 tons of other electrical machinery to the value of £99,000; 375 tons of mechanical handling equipment worth £123,000; 301 tons of metal-working machine tools costing £108,000; internal combustion engines totalling 3,113 b.h.p. to the value of £50,000; 39 tons of printing and book-binding machinery valued at £46,000; and 187 tons of pumps worth £83,000.

Of the British iron and steel and their manufactures that Pakistan imported from Britain in the first six months this year—18,674 tons to the value of £1,343000—nearly one-quarter was accounted for by wrought tubes, pipes and fittings. Of these Pakistan took 420 tons in June, bringing the total for the first half of the year to 4,082 tons worth £344,000. This compares with imports to the value of £279,000 in the first six months of last year and of £181,000 in the same period of 1951.

Other British iron and steel products imported in the first half of this year inculded 510 tons of railway and tramway construction materials for which Pakistan paid £55,000.

VEHICLES

In June, Pakistan imported £99,000 worth of British vehicles, bringing the total for the first half of the year to £2,084,000. These imports included 428 cars costing £169,000; 76 commercial vehicles valued at £79,000; 271 chassis for

vehicles other than cars to the value of £231,000; and 101 tons of cycle parts and accessories valued at £41.000.

"Miscellaneous manufactured articles," costing £2.387,000, formed another substantial item in Pakistan's imports from Britain in the first six months of this year. These included perfumery and toilet preparations to the value £70,000.

In the first half of the year Pakistan also took electrical goods and apparatus worth £685.000: cotton yarns and manufatctures to the value of £472,000; manufactured oils, fats and resins valued at £516,000; chemicals, drugs, dyes and colours worth £402,000; non-ferrous to the value of £271,000 (the largest item being £109,000 worth of copper manufactures—nearly three times as much as in the same period last year); and woollen and worsted yarns and manufactures costing £265.000.

Britain's imports from Pakistan in June this year was accounted for by jute and cotton to a combined value of £1,189,000. During the month Pakistan sent to the U. K. 6,816 tons of raw jute (which was over three times as much as in June last year) bringing the total for the first six months of this year to 110.574 tons valued at £8,864.000. In June Pakistan supplied the whole of Britain's imports of raw jute, and in the six months all but £104 worth.

Still Britain's second largest supplier of raw cotton and cotton waste, Pakistan's exports to the U. K. of these commodities in the first half of this year amounted in value to £4.524,000. Britain's total imports of raw cotton and waste in that period were worth £53.694,000. Pakistan was Britain's fourth largest supplier of raw cotton of under 1⅛ inch and over ⅞ inch staple, sending her in the six months 26,293,000 lbs. of cotton costing £2,987,000. In the first six months Britain also imported from Pakistan 13,779,000 lbs. of raw cotton of ⅞ inch staple and under, valued at £1,489,000. This was over two-thirds of Britain's total imports of this commodity, of which only £83,000 worth came from countries outside the Commonwealth.

In June, Pakistan exported to Britain 952,000 lbs. of raw wool valued at £197,000. This was five times the quantity she sent in the same month last year. During the first half of the year Britain paid £1,081,000 for 5,241,000 lbs. of sheep's and lamb's wool from Pakistan.

EXPORT OF TEA

Pakistani tea imported by Britain in June totalled 494,000 lbs. and brought the total for the first half of the year to 6,611,000 lbs. costing £770,000. Britain's total imports of tea for the half-year were valued at £34,610,000, of which only £1,504,000 worth came from non-Commonwealth countries.

The 118 tons of undressed hides and skins that Pakistan sent Britain in June brought the total for the first six months of the year to 1,071 tons—over twice the amount for the same period last year—valued at £494,000.

Animal feeding stuffs weighing 2,166 tons—twice as much as in the same month last year—and valued at £65,000 were exported to Britain by Pakistan in June. This brought the totals for the first half of the year to 13,093 tons and £396,000—well above the figures for the same period last year and four times as great as in the first half of 1951.

The latest overall figures for trade between Pakistan and Britain as shown in the Trade and Navigation Accounts of the U. K. are for the first five months of this year. In that period Britain imported from Pakistan goods worth £15,229,000 and exported to her goods to the value of £11,354,000.

Britain's total imports from Commonwealth countries during the five monthes were valued at £689,523,000 and her exports to the Commonwealth at £ 517,024,000.

RAW WOOL

The Commonwealth Economic Committee has estimated the increase of the world production of raw wool at about 1½ per cent. World production is estimated at 4,400 million lbs. (greasy basis) during the current season as against 4,327 million lbs. in 1952-53 and an average of 3,802 million lbs. over the pre-war period 1934-38. Australian produceion is expected to reach a new record level of 1,290 million lbs. as compared with 1,280 million lbs. in 1952-53. Production in Newzealand and South Africa is estimated at 421 million lbs. and 278 million lbs. respectively, as against 418 million lbs. and 268 million lbs. in 1952-53. Small improvements are expected in the U. S. A., Argentina and the U. K. The clean weight of the world clip is placed at 2,550 million lbs. as against 2,509 million lbs. in 1952-53.

U. S. INVESTMENTS

Heavy expenditure planned by American industry for plant and equipment reflect increased confidence in the nation's business future The Commerce Department and the Securities and Exchange Commission reported recently that investment in plant and equipment during 1953, will reach 27,821 million dollars. This would be a gain of five per cent. over last year's record high of 26,455 million dollars. This year's planned investments of American industry also exceed the total contemplated by the same business earlier this year.

The agencies indicated that American business plans to spend 14,400 million dollars on plant and equipment during the last half of this year. Public utilities planned to spend 4,400 million dollars this year. This is 15 per cent. above the rate for the last six months of last year. Manufacturers are expected to increase their expenditures about six per cent. to 12,700 dollars. Non-durable goods industries show the largest increase in this category.

The chemical electrical machinery and average industries showed the largest gains, ranging 20 per cent. or more above last year. Significant gains also were shown by non-electrical machnery, paper, petroleum and fabricated metal products companies. Small increases were shown by the mining and commercial companies, while railroads were the only major group expecting a significant decline from last year—about seven per cent.

BURMA'S LAND REFORMS

The Burmese land reforms as envisaged in her Land Nationalisation Bill which has just passed into law, may seem quite startling in character. And yet the reforms are only reforms such as socialism alone is capable of. For example, even though the Bill does not contain any clause relating to payment of compensation for land taken over by the State, a new compensation bill is expected to come up before the Burmese Parliament in the near future. In short, the Bill empowers the Government to resume private lands and redistribute them to the peasants. The Bill contains a detailed schedule for distribution of the different kinds of lands to the cultivators for individual ownership and co-operative production.

FROM PAKISTAN

Pakistan is reported to be considering a plan for entering into payments agreements with the Middle East countries on the lines of the one India has concluded with Egypt. Adverse balance of trade is giving her a headache at the present

moment. The two-fold remedy she proposes to apply to set it right includes provision of greater incentives to exports and a further enlargement of the items of her trade with overseas countries. She is not so badly off in her trade relations with India. Rather, she had a favourable balance of trade to the extent of Rs. 7.49 crores with India during the period from 8th August, 1952 to 31st July, 1953. During the period Pakistan exported to India goods worth Rs. 16.06 crores and imported from India goods worth Rs. 8.57 crores. Of the exported goods, the pride of place goes to rice which accounts for Rs. 1.16 crores; fish, eggs and poultry accounting for Rs. 1.33 crores; and to a lesser extent to fruits which account for Rs. 33 lakhs. During the period Pakistan imported coal worth Rs. 2 crores, mill-made cloth worth Rs. 89 lakhs and *pan* (betel leaf) worth Rs. 13 lakhs.

INDO-BRITISH TRADE

Britain's imports of raw cotton and wool from India continue to increase. This is shown by U. K. trade figures for August. In August, Britain took raw cotton worth £278,000, bringing the total for the first eight months of this year to £2,215.000, or over £900,000 worth more than in the same period of last year. Imports of cotton of ⅞ inch staple and under for the eight months increased from 2,495,000 lbs. (to the value of £237,000) to 7,004,000 lbs. (costing £682,000).

India also sent 9,936 tons of unmanu*factured cotton waste (to a valu £1,489,000) during the eight months* ‹ *pared with the 6,195 tons (wort. 1,058,000) sent in the same period* year.

The 14,550,000 lbs. of raw wool In sent Britain to the end of August, wo £3,188,000, compared with the 11,072,(lbs. (£2,122,000) sent to the end of Aug 1952. This mainly consisted of shee and lamb's wool, of which India se Britain 1,373,000 lbs. in August, bringi the total for the eight months to 13,049,0 lbs. to the value of £ 3,135,000.

Britain in August imported 34,840,0C lbs. of tea, practically all of which cam from Commonwealth countries. Nearl two-thirds was supplied by India, wh sent 21,366,000 lbs., making the total sh sent to Britain in the eight month 176,488,000 lbs. to the value of £24,607,00C by far the biggest item in Britain's imports from India.

The 11,391,000 sq. yds. of jute piece-goods India sent Britain in August—representing practically all of Britain's imports under this heading and being 495,000 sq. yds. more than she sent in August last year—brought the total for the eight months to 81,864,000 sq. yds. to the value of £2,995,000. Britain also took in August 1,279 tons of Indian jute sacks and bags. This was over 500 tons more than she took in August last year and it made the total received in the first eight months this year 13,386 tons worth £1,1440,000.

AGRICULTURAL TIPS

MELON CULTIVATION

Melons are grown in many parts of India, but are as a rule insipid and of poor flavour. In Southern India next to Siddhavattam (Siddhour) in the Cudapah District, Kurnool is also a place famous for superior melons. In Northern India, Farrukabad is famous for its melons and white-fleshed water melons. In Lucknow and Farrukabad the most famous variety is known as the "chitla." The fruit is small and round with a green skin, mottled with white dots. The flesh is white, somewhat granular and of excellent flavour. It is edible upto the rind. The "Saradha melon" of Kabul is another most famous variety.

SECRETS OF MELON CULTURE

The secret of successful melon culture seems to lie in the co-existence of the following conditions :—

(1) The soil must be sandy.

(2) There must be underground springs (of water) within a foot from the surface of the soil.

(3) The climate should be hot during the growth of the plant, and the swelling of the fruit. Rain or cloudy weather during the growth is injurious to the crop. The fruits either rot or become diseased while yet tender, if rain falls.

(4) Irrigation overhead or in the ordinary manner as for field crops makes the fruits insipid.

(5) Rich nitrogenous manure like the groundnut oil cake, seems to take away the sweetness and the fine flavour from the fruits. Therefore special manures which will promote the sugar content of the fruit must be sought out and applied.

The melons are raised in the sandy bed. In Madras, each ryot selects his plot in the river bed. On these plots, pits three to six inches deep, and 12 to 18 inches apart are dug about the middle of December. Fresh sowings are repeatedly made according to the convenience of the gardeners and the demand in the fruit market upto the end of March. These pits are about 18 inches in diameter. About 20 pits are dug in a straight line and form a row. At both ends of the row about 2 feet of ground is left blank or empty, so that the gardener may walk between the rows for after cultivation. After the distance from one row to another (which run parallel to each other) is four to five feet.

PREPARING SEEDS OF MELONS

The seeds of melons retain vitality for about three years. Seeds which are two years old are generally sown, because the plants grow vigorously and bear excellent fruits. The seeds are saved by taking out the fresh seeds from ripe fruits, and mixing them with the ashes of cow dung. The seeds should not be washed in water. These seeds mixed with ash are made into small cakes like the cow dung cakes, and stuck on the wall and allowed to dry. After the seeds are well dried, the cakes may be preserved in a closed vessel or be left on the wall itself. Insects do not attack the seeds on account of the ashes.

Ten days before sowing these seed cakes are taken out and broken up so as to separate the seeds from the ashes. All the little stones etc., are removed. The seeds with the fine ash is dried in the sun for one day and is kept by. Then two days before sowing a certain small quantity of seeds is loosely tied in a cloth; and the bundle of seeds is soaked in an earthen pot or basin containing clean fresh cold water. The next morning after about 12 hours' soaking, the bundle is taken from the vessel of water and put on bare ground and allowed to drain away. But water must be sprinkled frequently on the bundle so that the bundle of seeds may be always moist. The wet seeds should on no account be allowed to dry. Then on the morning of the third day i.e. about 24 hours after the bundle was taken out of the water in which it was steeped, the bundle is carefully untied, and the seeds taken out. It will be

found that practically all the seeds would have germinated or sprouted. It is these seeds which are sown in the fields.

METHOD OF SOWING AND TRANSPLANTING

In the pit the soil is dug with the hand or with a light hand-hoe, about six to 9 inches deep till the underground spring water is within an inch from the bottom. Into this small pit, which is about 3 or 4 inches broad, one handful of well-rotted cattle manure is put on the moist surface. On this manure a light layer of river sand is spread thinly, just covering the manure. On this sand, one or two of these sprouted seeds are sown or put. This seed or seeds are again lightly covered with some more sand. No water is given after sowing. In three days after sowing, the seed would have germinated and grown into a small seedling. Again some gardeners raise seedlings by sowing seeds in a small nursery plot or seed bed and transplant them when they are about seven to ten days old and about 4 inches high. But transplanting, except when the crops are raised early in December is not common.

THE OUT-TURN

About 26 days after sowing, when the necessary manure has been applied, the young plant will have a number of flowers and young fruits ; and the vines or branches would be creeping for some distance on the ground on all sides. These vines are turned by the men, so that they may lie only on two sides of the plant and grow towards the furrows or hollows between the rows of melons. This is done by burying a leaf about 9 inches from the tip or end of the vine in sand, about ½ inch deep. Then the gardeners pinch off with the hand the growing portion of the branch, leaving about 6 or 8 inches of the vines beyond the buried leaf. The vines or branches are also set straight in the very beginning ; and they are so laid that one vine or branch cannot touch the other, even later on. It is a kind of pinning each plant or branch to a particular spot so that it may not move this side or that side. This process is considered very important. 70 to 75 days after sowing when the plants have finished bearing fruits, if we dig up around the plants, we will find that practically all manure supplied has been utilised by the plant. The fruits are ready for the market when plants are 75 days old. The gardener gets on an average only one fruit for each plant. In rare cases, a plant may yield even 2 big fruits. The other fruits generally canker away and rot when tender.

AGRICULTURAL OPERATIONS

For September

FOR THE PLAINS

Vegetables—Making sowings of Patna peas.

Commence sowings of cauli-flower, cabbages, knol-khol and artichoke in pots under shelter, or on a raised piece of ground under a hogla, in order to have plants well forward for putting out in the open ground as soon as the rains are over.

Fruits—Peach stones sown now will come up in February and afford stocks for budding upon in August.

Prune away the lower most leaves of coconut trees.

Ornamental Plants—Sowing of aster, heartsease and cineraria should be made this month as these plants take a long time to mature for blosoming favourably.

At the beginning of this month show balsams in Lower Bengal.

Richardia ethiopica and several species of oxails will now be moving. They should be potted and brought to the light immediately they appear above ground.

FOR THE HILLS

Vegetables—About the beginning of this month seeds of carrots, cabbage and cauli-flower may be sown under shelter for the late autumn supply ; other seeds might also be sown if there is room available for them. About this time suitable plants should be selected for seed.

Fruits—Some of the later varieties of apples, pears and plums ripen in this month and will require to be protected from the depredations of birds. After the fruit is removed all dead and decayed wood should be cut away; the old wood and such as has done bearing should be cut back, and the trees trimmed to the shape it is

intended they should take. As a rule this work is sadly neglected in hill gardens and the result is trees of stragging growth, over-crowded with unnecessary wood, to the great detriment of the fruit bearing wood which gets no chance to develop. Seeds of apples, apricots and pears may be sown now, if it is desired to raise seedlings.

Flowers—Dahlias will now be finishing their blooming and steps should be taken to put down tallies in the spot where the roots are intended to remain for the winter, so as to identify them next year. Withered flower heads should be removed, unless it is intended to gather seeds. The better plan is to take up all the tubers after the plants have finished their growth, and to store them away in dry sand or saw dust. Most of the annuals will now have finished their flowering, season, and arrangements should be made to gather seed. Perennial phloxes should be put under shelter at the end of the month. Cuttings of geraniums, picotees and canations can now be put down with much advantage.

AGRICULTURAL OPERATIONS

For October

FOR THE PLAINS

Vegetables—As soon as the rains are over, no time should be lost in preparing the ground and making sowings of turnips, carrots, peas, beans, french beans, lettuce, tomato, spinach, mustard, raddishes, beet, onions, and leeks.

Sow in Bengal English cucumber seed and American squash. Put out in their places in the open ground young plants of cauli-flowers, cabbage, knol-khol, artichoke and asparagus.

Fruits—Now is the seasons for making up straw berry beds and putting in the plants. In the Upper Provinces gather Putwa before it is injured by the cold. Sow seeds of almonds guava, lichee, peaches plums, pumelo, strawberry, hog-plum etc.

FOR THE HILLS

Vegetables—Celery beds should be supplied with fresh manure now. Artichoke seeds may now be gathered, and the plants cut out, the roots being supplied with fresh soil. Sowings for the winter supply should now be made in frames of lettuce, cress, radish, etc.

Fruits—The fruit trees will now be entering that stage in which they will require rest. Water should be withheld, except occasionally. Opportunity should now be taken, at the end of this month, of giving them a general pruning. This operation is very much neglected on the hills. Those trees have not fruited during the season, should now be root-pruned.

Flowers—Most plants will now be entering the rest stage, and water should be sparingly given to such plants as ferns, gloxinias, gesneras, dieffenbachias, etc. which should be allowed to die down gradually. Seeds of annuals should be gathered, and the beds and borders clearned of the dead plants, which might be done by digging them into the soil.

AGRICULTURAL OPERATIONS

For November

FOR THE PLAINS

Vegetables—Make successive sowings of peas, French beans, turnips, carrot, raddish, lettuce, beet, mustard and cress. Thin out betimes turnips, carrots and beet. Make successive plantings of cauliflower, cabbage, knolkhol, lettuce and cellery. Stick peas before they begin to fall about. Earth up potatoes. Yarns are now fit to be taken up for use. Plant out onion bulbs for obtaining a crop of seed in April. Take up mint and plant it in a fresh soil, well enriched.

Ornamental Plants—The is the best season for putting down cuttings of all kinds of roses, and indeed of most exotics—natives of colder climates. The several species of canna may now be dug up, parted, and planted in fresh ground.

FOR THE HILLS

Vegetables—During this month there is not much to be done in the way of sowing. Seedlings of last month's sowing should be put out under shelter. This is the best month for gathering seeds of most vegetables which have finished their growth.

(Continued on page 314)

Scientific Researches and Inventions

RECORDING BABY'S HEART BEATS BEFORE BIRTH

News has been received from London of an interesting medical apparatus for simplifying and recording foetal heart sounds. Developed at the Lewisham Hospital, London, this apparatus, it is reported, not only amplifies the sounds of a baby's heart beats before birth but demonstrates their visual characteristics on the screen of a cathode ray tube. It is, therefore, a vital aid to clinical obsterics and a medium for research into foetal heart sounds. The apparatus was recently shown as an exhibit of the Christie Hospital and Holt Radium Institute, Manchester.

COLOUR-MIXING MACHINE

News has been received of the development of a machine that can mix and deliver paint in any one of a thousand colours in a matter of seconds. The dispenser is designed to fit the typical paint store where, with a setting of dials, it can produce instantly a quart, gallon or five gallons of paint of the desired colour in flat enamel, satin gloss or high gloss. The machine, which measures nine feet by three feet and stands six and one-half feet high, is billed by its manufacturer as "the first fully automatic colour-mixing machine," and a purchaser will be able to select his colour, have it mixed, and carry off the paint in a few minutes. It will duplicate any colour, tone or shade without deviation. It is reported that the instrument cuts the number of man-hours needed for handmixing operations, and can be operated by anybody with only a few hours' instruction.

HELMET FOR JET PILOTS

A new type of helmet for jet aircraft pilots has been designed to withstand the increased speeds expected in future jet models. Current headgear, according to experts will not provide adequate protection to pilots bailing out of the jet aircraft of the future. The speeds at which the projected jets are expected to travel would tear off the pilot's helmet as well as his oxygen supply, they say. The new helmet has three slots, an inch and a half long and five-eighths of an inch wide, cut across the front crown. These reduce wind shock and help keep the helmet in place. According to expert opinion, the slots not only serve as a means to let inside air pressures escape but also create a partial vacuum which helps to hold the helmet firmly in place." At present, the new product is in the experimental stage, and each piece of headgear has to be tailored to the individual wearer.

THUNDERSTORM ENERGY EQUALS 50 ATOM BOMBS

It would take at least 50 Hiroshima-type atomic bombs to equal the energy required to make one thunderstorm, says Dr. Rosco R. Braham, University of Chicago meteorologist. In the average thunderstorm, 1 to 1½ quadrillion calories of heat are required to accumulate moisture from the atmosphere and carry it in an up-draft inside the storm. The Hiroshima bomb generated 20 trillion calories a puny figure by comparison. But even if 50 atomic bombs were exploded all at once, the effect on the atmosphere wouldn't be the same. The normal thunderstorm builds up over a period of several hours. Hot, moisture-laden air soars up, building towering thunder-heads. Finally, the vapour forms into snow or ice crystals which start falling and accumulate moisture on the way down. Only 10 per cent of the moisture a thunderstorm gathers in usually falls to the ground as rain, but that is more than formed by atomic bombs.

STEEL OR IRON COATED WITH ALUMINIUM IN LOW-COST PROCESS

Steel or iron can be coated with aluminium in a simple and inexpensive process recently developed by General Motors researchers. Heated to a temperature of about 1300 degrees in a bath of preheating salt, the metal to be coated is placed in an aluminium bath for 30 to 60 seconds. It is redipped in the first bath and finished by airblasting. "Aldip" metals are corrosion and rust-resistant, and they are heat-resis-

tant when specially treated. They are expected to replace certain scarce heat-resistant materials now vital to the national defense.

ELECTRONIC GUIDE PILOTS LAWN MOWER THROUGH TALL GRASS

Guided by an electronic " feeler " that ferrets out tall grass, a robot lawn mower does its job without human help. The machine is thrown into gear by raising the handle to an upright position. Once an initial swath is made in the lawn, the mower follows the uncut-grass line in decreasing circles until the last thin line is cut. The electronic feeler, " brain " of the mower designed and built by Raymond P. Meyer of Omaha, is located just ahead of the front wheel. Only three inches long and two inches wide, it operates on two dry-cell Batteries. The mower's one-horse-power engine weighs only 14 pounds and the complete unit totals 50 pounds.

ARTIFICIAL HEART

An artificial heart that produce " ventricular flutter " by means of which the blood circulation can be maintained for two hours although the heart has stopped pumping, has recently been tested in Sweden with favourable results reports *Vaz Dias*. The apparatus, which is all-automatic, has been constructed by Dr. Ake Senning and Mr. P. A. Astradsson, engineer of the AGA company. Ventricular flutter has hitherto generally been considered fatal. Experiments on dogs with this apparatus have, however, given promising results, several of the dogs operated on having survived.

PLASTIC HEART VALVE

Surgeons at the Georgetown University Hospital in Washington have successfully installed a plastic valve in the heart of a 30-year-old housewife. The patient's own heart valve was seriously damaged by rheumatic fever and she had been given little chance to live. The small tube with a plastic pea performs the function of the aortic valve which prevents blood from flowing backward into the heart.

FIGHTING BACTERIA WITH SOUND•

The discovery that germs are susceptible to noise may lead to an entirely novel method of purifying water, sterilizing milk according to a paper read at the American Chemical Society. It was found that many bacteria and other micro-organisms disintegrate under certain conditions if subjected to high frequency sounds. Studies are now in progress to determine the exact pitch and sound energy required to have a lethal effect on each type of micro-organism.

PLASTIC SURGERY

A relatively low cost process of treating cartilege taken from young cattle for use in plastic surgery on human beings has been announced by the Armour Laboratories of Chicago. The animal tissue, which can be kept on hand in a sterile solution, eliminates the need for preliminary surgery on humans to obtain cartilage for transplanting.

EFFECTIVE ANTI-MALARIAL COMPOUND

For some time now reports have been circulating about the effectiveness of a new anti-malarial drug, primaquine, synthesised by Dr. C. Elderfield of Columbia University, New York. After many months of clinical testing and investigation primaquine is hailed as a simple, inexpensive and almost sure cure for the vivax type of malaria. Primaquine provides three outstanding advantages in the treatment of malaria :

(*i*) routine treatment requires only 14 pills ;
(*ii*) the pills cost less than one cent each ;
(*iii*) patients need not be hospitalised ;

Vivax malaria is characterised by a dormant period of about 30 weeks in which symptoms of the disease may disappear temporarily only to reappear in full force at a later date. While quinine, atabrine, chloroquine and other substances can control the disease in its early stages, these drugs do not constitute a cure since malaria organisms spread by mosquitoes—after first circulating in the blood stream lodge in inaccessible body organs such as the liver, out of reach of the drugs. Thus continued control of the disease is dependent upon continued treatment with the older anti-malarial drugs. Primaquine, the doctors feel, is a cure for the disease because it can attack the parasites wherever they may become lodged in the body.

V-TYPE BLENDER SPEEDS MIXING OF DRY MATERIALS

Development of a V-type blender has speeded and improved the mixing of dry materials, such as are used in the manufacture of aspirin or other powder-base products. The blender, basically two metal or transparent-plastic cylinders jointed at a right angle, is set in a U-shaped frame and revolves slowly on ball-bearing mounts. The mixing motion is supplemented by a fording action as the blender alternately divides and combines the contents. A motor-driven bar studded with pins, placed across the interior of the blender at the axis of rotation, aids the mixing and can be used to disperse small amounts of liquid through dry material. Independently powdered, it turns at speeds as high as 3200 r.p.m., compared with the 2 to 32 r.p.m. of the blender.

OIL FUEL DRUMS RECLAIMED BY SPEEDY NAVY PROCESS

Battered fuel barrels bound for the scrap heap are made good as new by a speedy reconditioning process in use at a Navy depot. Leaky, rusty and dented drums are first straightened on their ends by a machine that takes the kinks out of the rims. Then a "dedenter" literally blows the dents out of the drum with high-pressure air. Diamond-shaped links in a chain scrape away rust on the inside of the barrel before a solution of hot caustic soda goes to work on it. Wire brushes flying around the outside of the drum clean off scale and loose paint. Leaks are plugged, paint is sprayed on and an infrared drying oven winds up the process for a cost of only one tenth as much as a new drum Over a month's time, the treatment saved the Navy almost $ 90,000. The process allows the drums to be stored in the open for 18 months without attention.

NEW SHUTTLELESS NARROW FABRIC LOOM

Brief details of a new automatic high-speed shuttleless loom which can be operated at speeds of up to 2,000 picks per minute, weaving fabrics ½ in. to 3 in. wide with a lockstitch edge. have been reported by the Textile Recorder New York Correspondent.

Developed by Mr. David Silberman, president of Disco Industries Inc., of New York City, the new machine is claimed to be several times faster than any other narrow fabric loom now available, and to be capable of producing 300 yards or more a day of zipper tape. Moreover, by virtue of a reduction of operations and the high speeds employed, the machine promises to effect labour savings of 66-2/3 per cent, the labour cost for 1,000 yds. of zipper tape produced on the new loom being given as 48 cents. compared with $ 1.50 for the same quantity of tape produced on conventional narrow fabric looms. It is also understood that the cost of the Disco loom is estimated at $ 2,000 for a four-head unit, as against $ 5,000 for conventional narrow fabric looms.

WEFT INSERTION AND WEFT LOCKING

The unit shown to the Press in New York was a single-head machine employing a weft inserting needle at one side and a weft locking device at the other. Through the use of needle mechanisms, Mr. Silberman explained, the machine puts a lockstitch edge on the fabric which eliminates unravelling. The weft supply is brought from a cone package at the back of the loom, through a stop motion and disc tension device, through the eye of a light extensible spring, and finally to the eye of the inserting needle. The extensible spring is important in that it prevents the weft from going slack on the withdrawal of the needle. At the other side of the loom there is a latch needle of conventional type, similar to that used on ordinary circular knitting machines, and a locking thread which also passes through a stop motion and tension device and then to the fell of the fabric. Incidentally, the same stop motion is used for both warp and weft and is actuated by the broken thread through the usual drop wire mechanism.

In operation, the weft inserting needle passes through the warp shed and places

the weft in the path of the open hook of the latch needle. Simultaneously, the locking thread is brought partially around the latch needle and into the open hook. The latch needle then moves towards the front of the loom, the latch is closed by the preceding loops and the threads in the hook are pulled through the preceding loops of the weft and locking thread chain which were around the shaft of the latch needle. With the stitch cast off, the latch needle moves back into position and this movement causes the threads in the hook to open the latch and slide down the shaft of the needle ready for the next cycle. This locked edge with the coincident loops of the weft and locking thread chain constitutes a main feature of the machine.

It should also be pointed out that with this new machine, it is possible to place the inserting needle right up to the selvedge at one side, and as the latch needle is almost flush with the other selvedge, the lateral movement of the needle is kept to a minimum. Again, as the weft inserting medium—an ordinary steel needle about ⅛ in. in diameter—is thin enough to enter the shed close to the fell of the cloth, a shallow shed can be employed.

SPECIAL TYPE OF BEAT-UP

To eliminate friction on the warp, which, incidentally, is also drawn from cone supply, the new loom incorporated a special device for beating-up the weft. Instead of the normal reed, a series of blades are used which, whilst thin, are strong enough to give sufficient force of beat-up even for heavy fabrics. Moreover, these blades are laterally flexible, being designed to be close together at the beat-up point and further apart in the back position, thus reducing friction. Should a change in settings become necessary, the spacers between the blades can easily be changed for ones of finer or coarser gauge.

Other details of the new loom to which reference may be made are

(*i*) the inserting needle, the latch needle and the read all move in a straight horizontal path to ensure smooth action and freedom from vibration when running at high speeds;

(*ii*) shedding is effected by means of grooved cams, which it is claimed provide positive shedding at high speeds;

(*iii*) only three changes of gearing are required to give a range of picks per inch from 8 to 128;

(*iv*) the new loom can be used to weave all the usual kinds of material, such as cotton, rayon, silk and elastic webs; and

(*v*) the number of harnesses may be regulated according to the pattern desired.

It is understood that because of the unique qualities of the fabrics woven by the new machine, Disco Industries has made application for United States patents for the cloth as well as the loom.

Discussing the possibilities of the machine in production work, a company spokesman stated that one worker should be able to supervise the operation of forty-eight single-head Disco looms capable of producing about ten times as much fabric as the conventional 48-head loom handled by a single worker. It was also pointed out that six Disco looms would occupy only 24 sq. ft. of floor space as compared with the 60 sq. ft. required for a conventional machine producing an equivalent amount of cloth.

A NEW DOUBLING, SEWING AND FOLDING MACHINE

Manufacturers whose practice it is to double their cloth and then sew it for processing in tubular form will find much to interest them in a new doubling, sewing and folding machine, known as moden DN, which Johannes Menschner, of Dulken, Germany, the well-known manufacturers of "Rosswein" warehouse machinery has recently introduced. The machine consists of three main parts, an automatic doubling apparatus, a sewing machine and a high plaiter. The fabric which is taken either in plaited or loose form passes first over a doubling angle and then to the automatic device which, through the medium of two sensitive feelers, electro-magnetic contacts and a set of regulating rods, lays the two selvedges of the fabric in exact position, one on top of the other.

From here, the doubled fabric is fed to the sewing machine which gives a stitch length of 0.8 in. and operates at a speed of up to 750 stitches per minute, corresponding to a fabric speed of about 15 metres (approximately 50 ft.) per minute. The sewn fabric then passes over a roller and then to the high plaiter for folding purposes. The whole machine can be operated by one girl.

Further details of the machine, delivery of which, it is understood, can be effected within four months can be obtained from Geoffrey E. Macpherson Ltd., of West Bridgford, Nottingham.

A NEW AID TO PRODUCTIVITY

A New instrument which provides a permanent time record of the running of a number of machines denoting the number and duration of stoppages, should prove of considerable value to managements concerned with questions of productivity and the operational efficiency of their plant. Much interest should therefore be shown in the new "Robinson" production operation-time recorder which F. C. Robinson & Partners Ltd., of Deansgate, Manchester, has recently introduced.

The standard model of this new instrument will record the performances of up to ten separate machines, and is supplied either in a walnut cabinet for desk use or in a metal case for wall mounting. It has a window 16½ in. wide, revealing the recorded behaviour of the ten machines on a chart, no protective glass being provided, so that written comments can be entered, if desired.

The machine consists basically of a white time-calibrated strip chart driven across the window at a normal speed of 2 in. per hour (though other speeds could be obtained) by a reliable electric clock movement. At the right of the window are ten electrically operated "pens" each of which is connected by wire to a separate machine. When a machine is started its associated pen draws a clear indelible black line on the chart, and immediately the machine stops the black line terminates in a clean, square end, enabling an "off" period of 30 seconds or more to be observed from several feet away. The "pens" are of special design and are an outstanding feature of the instrument; they operate on the sensitive paper without the use of any ink or fluid, and so should function indefinitely without cleaning or attention. Whenever required, the chart can be removed and filed as a permanent record of the machines' performance.

No batteries are required because the pen-operating current of approximately 0.1 amps. at 16 volts is supplied by the instrument itself. There is no danger of fire, and light twin-wire can be used between the recorder and individual machines. For many purposes, however, simple relays connected across the motor terminals of the machines are all that are needed to acute the "pens," though special contact arrangements can be supplied if required.

The textile applications of such an instrument will suggest themselves immediately. In some instances where the number of machines is not great, it may be desired to equip machines permanently with the recorder. When, however, the number of machines is large, one would expect the instrument to be applied to special sections where detailed information of performance is needed.

(Continued from page 309)

Fruits—There is nothing to be done this month out of doors. It is not usual to cultivate fruit trees under glass on the hill yet young plants might be protected from the frost, which begins this month.

Flowers—The principal operation this month is to protect such of the outdoor plants as need protection from the cold. Sometimes it snows during this month with heavy rain and sleet. In the houses the temperature must be raised and steadily maintained during the night, or the result will be fatal to many rare, beautiful and tender plants. Ferns and orchids in particular will suffer severely if the temperature is allowed to go down below 60°F. All plants will need less water, many none at all; but in this the gardener must be guided by experience and local requirements

SYMPOSIUM ON NON-FERROUS METAL INDUSTRY

A Symporium on the Non-Ferrous Metal Industry in India will be held under the auspices of the National Metallurgical Laboratory, Jamshedpur, in January 1954.

The Symposium is being held to focus attention on the present state of Indian non-ferrous metal industry and to discuss ways and means for stimulating its growth to meet present and future requirements. The Symposium will survey the non-ferrous mineral wealth of India, the applications of thermo-dynamic principles, melting and foundry technique, thermal treatment and fabrication technique, and powder metallurgy technique in the processing of the minerals. The Symposium will also go into the economics of the industry, the utilisation of by-products and reclamation of wastes and survey the researches into the development of non-ferrous alloys.

An important subject to be discussed will be the scope of the future expansion of non-ferrous metal industry in India in relation to the Five-Year Plan.

FACILITIES FOR TRAINING OF TRADE REPRESENTATIVES IN GOVERNMENT LABORATORIES

Requests were received some time back by the Government of India from the Indian Chemical Manufacturers Association that facilities should be provided for training scientific workers employed in laboratories maintained by the trade or private manufacturers, in Government research institutions with a view to achieving co-ordination and uniformity of standards.

A scheme for the provision of such training in different scientific subjects has been worked out in consultation with the Governments of Madras and Bombay. The following are the institutions where training will be given :—

1. The Central Research Institute, Kasauli.
2. The Central Drugs Laboratory. Calcutta.
3. The Haffkine Institute, Bombay,
4. The King Institute, Guindy.
5. The Institute of Science, Bombay.
6. The Veterinary Research Institute, Mukteswar.

Candidates for training will be selected by a Board consisting of a representative of the Director General of Health Services, the Director, Central Research Institute, Kasauli, the Director, Central Drugs Laboratory, Calcutta and a representative of the Institution where the candidate will be trained. A consolidated fee of Rs. 1,200 per annum will be charged from each candidate and will be payable in advance.

Persons interested can obtain further details of the scheme from the Director General of Health Services, New Delhi.

PROMOTION OF EXPORTS OF SPORTS GOODS

Ways and means of encouraging the development of the sports goods manufacturing industry and promoting the exports of Indian sports goods were discussed at a meeting in New Delhi. Shri T. T. Krishnamachari, Minister for Commerce and Industry, in his opening remarks said, the Government of India were very keen to promote the development of the Industry which was an important small-scale Industry.

The meeting discussed measures to ensure that only goods manufactured up to standard are exported. The possibility of setting up a central organisation on a co-operative basis for controlling publicity and exports was considered since individual units in the Industry were not in a position to undertake this. Representatives of the industry pointed out certain difficulties experienced by them in procuring the raw materials from within the country as well as from abroad. Government spokesman at the meeting assured them that Government would give them all possible help to enable them to obtain adequate supplies of the raw materials required by the Industry

from within the country and from overseas if necessary. They were also assured of every possible assistance from Government in publicising their goods in the overseas markets.

Representatives of sports goods manufacturers from the Punjab, Delhi and Uttar Pradesh attended the meeting along with representatives of the Federation of Indian Chambers of Commerce and Industry. In the course of the discussion in the meeting it transpired that after the partition a number of sports goods manufacturers and workers who were previously engaged in this Industry at Sialkot, had settled down in Jullundur, Meerut and Delhi. The industry which is run on a smallscale basis provides employment for about 4,000 workers and produces goods valued at about Rs. 75 lakhs annually. India exports sports goods to a number of countries. Exports during 1950-51 were of the value of about Rs. 13 lakhs. It appears that there has been a decline in the exports of some of these goods during the year 1952-53 whereas exports had shown rising trend during the last few years.

INCREASING INDIAN TEA CONSUMPTION

The Government of India are planning to send a tea mission to Australia and the U.S.A. shortly to explore the possibilities of increasing consumption of Indian tea in those countries.

Meanwhile, tea industry—one of India's major dollar earners—which suffered a "fall in price crisis" last year was now "out of the woods" and was working profitably, according to tea circles. Last year's slump, they stated, was perhaps justified to the extent that it helped in disposing of the "unwanted tea" from the market.

The 6,240 tea gardens which cover about 7,85,000 acres, produced 6,22,466,627 lbs. of tea in 1952, an increase of about seven lakh lbs. over the production of the previous year. About 43 crores lbs.—representing 68.7 per cent of the total crop —were exported in 1952 bringing a revenue of Rs. 1·45,715,000 to the Union Exchequer.

REHABILITATING COTTAGE INDUSTRIES

The Government of India, have, approved and started implementing a number of interim recommendations which have been made by the All-India Handloom Board and the All-India Khadi and Village Industries Board, designed, not only to rehabilitate these cottage industries but to help solve unemployment problem in the country.

The recommendations cover a wide field, ranging from detailed schemes of marketing of the products to outright grants to various organisations engaged in the works.

These Boards along with All India Handicraft Board were recently set up as autonomous bodies consisting of eminent non-official, social and constructive workers and the Central Government have undertaken to implement their recommendations as far as feasible and practicable.

One of the principal recommendations made by the Handloom Board which has been put into operation relates to schemes for internal marketing of handloom cloth, while the scheme for the expansion of external marketing of the product is being finalised.

The Central Government has set up a Central Handloom Marketing Organisation and allotted an annual grant of Rs. 4,61,000 for the purpose. The internal marketing scheme is intended to assist the handloom industry in respect of marketing organisation, rationalisation, research and publicity.

PLYWOOD MANUFACTURERS ASSOCIATION OF INDIA

The Third Annual Meeting of the Plywood Manufacturers' Association of India was held at Calcutta. The meeting was presided over by Mr. N. N. Bose, President of the Association. The following are extracts from his speech at the meeting :—

"The year 1952 has been a dark one for the tea industry. Tea prices, which began to fall since the autumn of 1951, went on falling till towards the end of 1952, and the market was at its lowest for over a decade and tea estates were suffering huge losses. It is not my intention on this occasion to review the reasons for such a sad turn in the prosperous tea industry. That has been done by competent representatives of the tea industry on various occasions. Neither do I want to participate in the controversy as to the part played by the Government in not helping the tea industry in one of its worst crises. I would, however, like you to take one lesson to learn from this bad situation and that is best illustrated by the saying. "It is not safe to put all your eggs in one basket."

"I have told you on previous occasions that there is ample scope for use of plywood in other spheres. In a country like India, plywood industry can brighten the houses of many middle class and poor people by supplying cheap, light and durable items of furniture. It has got vast potentialities in neighbouring countries, both in the Middle East and in the Far East, if not in Europe itself. While making this statement, I am fully conscious of the fact that most of our plants are small and meant for tea chests only but I think that, even with these small plants, with but a few additions in machinery, it is possible to produce a certain percentage of plywood for other uses and not to depend on the tea industry hundred per cent. One of my aims will be to see how it is possible for plants like ours to manufacture plywood for household purposes.

"The second lesson that we should take from the crisis which faced the great tea industry in 1952 is that there is no room for complacency even in a highly organised and prosperous industry like the tea industry, not to speak of an industry like ours It is now well known and well accepted that one of the main reasons for the crisis in the tea industry was overproduction and the situation showed improvement as soon as it decided on curtailment of production. If an industry like the tea industry could not avert a crisis by only 10 per cent. overproduction, it is no wonder that the plywood industry is also passing through a crisis, firstly, on account of fall in demand from the tea industry for reasons stated above and, secondly, because the capacity of the tea chest industry, according to official estimate, now stands at over 9 million tea chests when the internal consumption can at best be about 5 million. The need for control is, therefore, evident. The other alternative is chaos.

"In my speech on both the occasions of the last two annual general meetings of the Association, I appealed to you for cooperation, goodwill and sacrifice. The time has come when this has to be put in practice for the common good—for the common safety. I am accordingy thankful to Dr. Nagarja Rao, the Industrial Adviser, for arranging a meeting of the Indian plywood manufacturers in Calcutta. We shall, discuss various problems confronting the industry and, if we succeed in devising some means whereby the plywood industry can be sacrificed from some or all of us—we shall have taken a step which we shall never repent and for which we shall feel happy in years to come.

"I have dwelt at some length on the above subjects, as these have been haunting me for some time past. I consider them as most imporTtant for stabilising the industry and most essential for freeing it from periodic ups and downs which have been a sad feature of this industry since the war ended. I shall now pass over the other subjects hurriedly.

"The most important of the year has, as has been pointed out in the report, been the enquiry for continuance of protection by the Tariff Commission under the chairmanship of Dr. B. V. Narayanaswamy Naidu. Although the report is not out I have every confidence that protection will be continued for another term. I would,

however, urge on you, with all the emphasis that I can command, that you should take this opportunity as the last one in putting the industry on a sound footing, so that further protection becomes unnecessary. As a matter of fact, from the way the industry is expanding, I should think that we should be able to export a good quantity of plywood in course of another two or three years and the necessity for imports of foreign plywood will not arise in future.

"The import policy in 1952 was not, in the particular situation confronting the tea industry, helpful to the plywood industry. The special licence granted to the buyers of the Assam Saw Mills and Timber Co. Ltd., was uncalled for and harmful to the cause of the indigenous industry. The Government has, however, made good, to a great extent, the harm done to the industry but not allowing any import of tea chests in the first half of 1953. For this the Government deserves the best thanks of the industry."

"The Government has, however, allowed 5 per cent imports in the second half of this year. Although this is a small quantity and may be taken as a token import to which no objection should ordinarily be taken, it may be pointed out that the condition in the plywood industry is very serious and any imports could have been postponed till the situation improved somewhat. In view of the fact that there is no demand for tea chests, either indigenous or imported, it is to be hoped that the Government will see that licences for imports are not granted immediately and that they are issued only after orders begin to be placed with the indigenous industry."

"I am very pleased to say that our laboratory and test house has been doing useful work. Not only the products of our members are beng tested there but it is helping the J.F.Os. by testing samples sent by them to the Association laboratory. This shows the important part that is being played by the laboratory and the esteem in which it is held.

ASSOCIATION OF ELECTRICAL UNDERTAKINGS, BOMBAY PROVINCE

Mr. N.C. Javeri, J.P., Vice-President (who presided at the twelfth annual meeting of the Association of Electrical Udertaking in the absence of Mr. K.G. Milne), called for expendition on the part of the Central Government in enacting some of the important amendments to the Electricity (Supply) Act. The primary concern of the electric supply industry was the need for the reasonable return permitted to the investor being upgraded from the present level of 5 per cent. to 6 per cent. The financial provisions of the Act were designed to secure that a licensee shall earn a resonable return to enable him to raise finance in the capital market for the proper conduct of his public duties, and it was becoming difficult for the industry to do this within the present limit of 5 per cent. On the expansion of the public utility system (in which private enterprise continued to have a major share) depended the economic progress of the country and enlightened State policy should not militate against the progress of a basic industry like electric supply.

Mr. Javeri referred to the delay on the part of the Bombay Government in constituting the State Electricity Board and underlined the importance of the early formation of the Board with some at least of its personnel comprising representatives of private enterprise. The present time limit within which the State Governments had to constitute the boards was 31st March, 1953, and he hoped that by this date the State Electricity Board would have begun to function. In any case he called upon the Central Government to stand no further procrastination on the part of the State Governments.*

Company Reports

KHATAU MAKANJI SPINNING & WEAVING CO. Ltd.

The working of the Khatau Makanji Spinning and Weaving Company, Ltd., (Agents : Messrs. Khatau Makanji & Co., Ltd., Bombay), during the year ended 30th June, 1953, has resulted in a gross profit of Rs. 25.73 lakhs, recording a contraction of Rs. 7.20 lakhs from that earned in the previous year. This is the second year in succession that the Company has recorded a fall in earnings, the gross profit for the previous year having shown a decline from successive recession in the Company's profit Rs. 41.68 lakhs to Rs. 32.93 lakhs. The successive recession in the Company's profit during the last two years has taken the profit for the year under review to the lowest level in the last four years. The net profit also has dropped from Rs. 8.63 lakhs for 1951-52 to Rs. 4.43 lakhs which represents the lowest profit earned by the Company during the last decade. The dividend on the ordinary shares has, however, been maintained at 10 per cent., to which level it was reduced last year from 14 per cent. paid for the year 1950-51. The maintenance of the dividend at the previous year's level has been done without any addition to the reserves. This is the second year in succession that no addition has been made to the general reserve fund. It may, however, be noted that a sum of Rs. 4 lakhs was added last year to the contingency fund which had been created two years ago.

The following comparative table shows how the fortunes of the Company has varied in the last three years :

(In lakhs of rupees)

For the year ended 30th June

	1953	1952	1951	1950
Sale proceeds	379.53	407.05	361.02	305.91
Stocks	51.50	52.43	53.81	47.23
Expenses	354.64	373.34	326.49	283.99
Gross profit	25.73	32.93	41.68	26.64
Agents' commission	2.65	4.25	4.73	2.62
Provision for taxation	0.50	7.25	11.19	5.55
Depreciation	18.15	12.70	12.18	11.91
Net profit	4.43	8.63	13.68	6.56
To reserve fund	–	–	1.00	1.00
To reserve fund	–	–	1.00	1.00
contingency fund	–	4.00	6.75	–
Dividends—				
Preference	1.45	1.80	1.80	1.80
Ordinary	2.99	2.99	4.19	2.59
	(10%)	(10%)	(14%)	(12%)
Carry forward	0.23	0.24	0.31	0.47

As will be noted from the above table, the Company's sale proceeds of cloth, yarn and waste have declined by Rs. 6752 lakhs during the year under review, thus reversing the upward trend noted in the previous two years. No doubt expenses also have gone down, but the decline, namely, Rs. 18.70 lakhs, is relatively smaller than that noted in sale proceeds. Of the expenses, the value of cotton and staple fibre consumed shows a decline of Rs. 18.46 lakhs to Rs. 192.32 lakhs and stores, colours and chemicals of Rs. 12.64 lakhs to Rs. 33.66 lakhs. The decline in the value of raw materials and stores has been offset to a large extent by the increase in the cost of coal, fuel and power by Rs. 2.08 lakhs, salaries, wages, bonus and food allowance by Rs. 13.47 lakhs and contribution to provident fund by Rs. 1.89 lakhs. The decline in raw materials and stores consumed and in sales suggests that the Company's production must have been lower, though there has not been any corresponding decline in wages and other production costs.

The cut in the provision for taxation from Rs. 7.25 lakhs to Rs. 50,000 is due, besides the drop in gross profit, to the intial depreciation allowances for purpose of taxation allowed on the substantial additions made during the year to the fixed capital expenditure. This is evident from the increase of Rs. 5.45 lakhs in the provision for depreciation. The net profit of Rs. 4.43 lakhs is just sufficient for payment of dividend on the preference and ordinary shares.

AGUE MIXTURE

Quinine sulphate	½	dr.
Sulphuric acid dil	½	„
Syrup of orange	1	oz.
Glycerine	4	dr.
Water to make	8	oz.

Dissolve the quinine in the sulphuric acid then add the glycerine and syrup. Lastly make up the required volume by adding water. Dose 1 oz.

TONIC FOR BALDHEAD

Sweet oil	8	oz.
Almond oil	8	„
Oil of origanum	1	dr.
Oil of lavender	1	„

Mix all together. Apply daily over the head with a soft brush.

BORIC EYE OINTMENT

Boric acid, in very fine powder	20	gr.
Simple eye ointment	480	„

Triturate the boric acid with a portion of the melted simple eye ointment until smooth and gradually add the remainder of the melted basis. Triturate continuously until the product is cold.

To prepare simple eye ointment proceed as follows :-

Wool fat	50	gr.
Yellow soft paraffin	450	„

Melt together, filter while hot through coarse filter paper and sterilise by heating at 150°F for one hour.

CAMPHORATED SULPHUR OINTMENT

Sublimed sulphur	1	oz.
Carbolic acid	1¼	„
Resorcin	1¼	„
Camphor	1¼	„
Solution of coal tar	2½	„
Lard	21	„
Soft paraffin	21	„

Melt the lard and soft paraffin and then incorporate other ingredients after removing from the source of heat.

CANTHARIDIN LOTION

Cantharidin	1¼	gr.
Acetone	1	fl. oz.
Castor oil	4	„ „
Alcohol (90 p.c.) to produce	20	„ „

Dissolve the cantharidin in the acetone, add the castor oil and sufficient alcohol to produce the required volume.

COUGH DROPS

Brown sugar	10	lbs.
Tartaric acid	2	oz.
Cream of tartar	½	„
Water	3	pints.
Anise-seed flavouring		q.s.

Melt the sugar in the water, and when at a sharp boil add the cream of tartar. Cover the pan for 5 minutes. Remove the liq. and let the sugar boil up to crack degree i.e. if a quantity of syrup is allowed to drop on the cool floor it at once sets to a hard mass. At this stage turn out the batch on an oiled stone slab, and when cool enough to handle mould in the acid and flavouring. Pass it through the acid drop rollers, and when the drops are chipped up, and before sifting, rub some icing with them.

EASTON'S SYRUP

Iron, in form of wire	8.60	grams.
Phosphoric acid concentrated	62.50	millis.
Strychnine, in powder	0.57	grams.
Quinine sulphate	14.80	„
Simple syrup	700.00	millis.
Distilled water, sufficient to produce	1000.00	„

Dilute the concentrated phosphoric acid with an equal volume of distilled water in a small flask ; add the iron and heat very gently until dissolved; add the solution to the strychnine and quinine sulphate previously triturated with 30 millilitres of the distilled water; when solution is complete filter the syrup, and pass sufficient distilled water through the filter to produce the required volume.

Dose, one to two fluid drachms.

ARTIFICIAL SLATE

Artificial slate is made as follows :—

Kieselguhr	45	parts.
Portland cement	45	„
Lamp black	10	„

Thoroughly mix all to get a uniform powder. Then add 70 parts of water and work in well. The resulting mix is a damp, pulverent crumbly agglomeration. This mixture put into moulds and subjected to a pressure of approximately 200 lbs. for square inch will yield a shaped body which will set to a stone like mass in a few hours. The dry powder will keep indefinitely, but once the water is added the shaping must take place within an hour. After setting, curing in a damp atmosphere for a few days will materially increase the strength.

If more water is used than above, a paste will result. The paste need not be moulded under pressure, but the resulting set product is much denser.

BED BUG EXTERMINATOR

Insect powder	8	oz.
Colocynth	2	„
Methylated spirit	32	„
Macerate for 8 days strain and add Carbolic acid	1	„
Oil of turpentine	4	„

BELTING PASTE

Black treacle	2	lbs.
Rosin, powdered	½	lb.
Whiting	¾	„
Black soot	2	oz.

Mix thoroughly and rub a little inside the belt.

CHEMICAL BLOTTING PAD

A cheap and excellent substitute for blotting paper may be made as follows : Mix 14 parts by weight of gypsum and 2 parts of potato flour with sufficient water to produce a plastic paste. Press into a suitable mould. As soon as the mass has become hard and dry, it affords an admirable blotter. This may be made in the form of hand blotter as is usually found in most of the offices.

CARNAUBA WAX SUBSTITUTES

These following mixtures replace Carnauba wax in polishes, in fact, they are good bases from which to produce shoe and other polishes. All that is necessary is to melt with sufficient turpentine oil, etc. to a paste, then colour as required.

I

Paraffin wax	18	lbs.
Carnauba wax	6	„
Stearic acid	6	„
Rosin	4½	„
Ceresin wax	3	„

Melt together.

II

Ceresin wax	18	lbs.
Yellow beeswax	7½	„
Carnauba wax	4½	„
Stearic acid	5	„

Melt.

GELATINE CAPSULES

Gelatin	10	parts.
Water	20	„
Glycerine	10	„

Soak the gelatin in water overnight then apply heat. When dissolved add the glycerin and mix thoroughly. Now take iron rods with pear-shaped ends, slightly greased with olive oil and dip them into this solution. Take out the iron rods and let cool and solidify. Cut around the stick, pull off the pear-shaped capsule. Dry, fill with the desired medicament and close the open end by a drop of the above solution.

CHEWING GUMS

Granulated sugar	32	oz.
Glucose	32	„
Water	32	„
Agar-Agar	1	„
Lump white starch	1	„

Soak the agar-agar in cold water before use. Remove and put in a large pan with the water, and dissolve by simmering, then pass through a fine sieve. Next mix starch in a little cold water, and put the whole into a large pan, and boil to jelly point, stirring as required.

Then colour, flavour and add tartaric or citric acid to taste. Then run out, and dry on a stove for two days.

CLOTH STAMPING PASTE

Cloth stamping inks are prepared in various ways, of which the inks made with mineral colours and an oily basis are generally used.

The following recipes are recommended :—

BLUE

Ultramarine blue	5	lbs.

Reduce the ultramarine to an impalpable powder, and mix with the linseed oil.

GREEN

Verdigris	6	lbs.
Oleic acid	1	lb.
Olive oil	8	lbs.

RED

Vermilion	8	lbs.
Linseed oil	1	lb.
Olive oil	4	lbs.

Prepare as above. All the above inks should be well shaken before pouring on the pad.

DEPILATORY PASTE

Gum Tragacanth	20	gr.
Water	1	oz.

Soak the gum in the water until it forms a homogeneous jelly, then liquefy.

Sodium sulphide	40	gr.
Glycerine	1	dr.

and incorporate with the above jelly.

It should be kept free from the action of the air by packing in collapsible tubes.

A little terpeneol may be added as a perfume.

INCREASING MELTING POINT OF BUTTER

Butter, for use in hot climates, is mixed with melted glyceryl tristearate (an edible product), in various amounts, to increase its melting point.

LITHOGRAPHER'S PROTECTIVE HAND CREAM

Lanolin (Anhydrous)	20	parts by weight
Paraffin Wax	6	" "
Paraffin Oil	7	" "
Glycol Stearate	12	" "
Water	55	" "

Melt lanolin, glycol stearate, and wax; add oil; then add water while agitating rapidly until cold. This gives protection against water solutions of moderately concentrated acids.

BOILER COMPOUND

Soda ash	87	oz.
Trisodium phosphate	1	"
Starch	1	"
Tannic acid	2	"

Use powdered materials, mixing well and then pass through a fine sieve.

DRY CLEANING FLUID

Glycol oleate	2	fl. oz.
Carbon tetrachloride	60	" "
Naphtha	20	" "
Benzin	18	" "

Mix. This is an excellent cleaner that will not injure the finest fabrics.

NON-POISONOUS FLY PAPERS

Quassia	16	oz.
Colocynth	2	"
Long Pepper	4	"
Water	1	gallon.

Boil until the decoction is reduced to 4 pints; strain and dissolve in the clear liquid 1 oz. of sugar.

Dip the absorbent paper in the solution and dry. For use, moisten the paper with water or place the paper in a dish containing water.

HYDRAULIC BRAKE FLUID FOR AUTOMOBILES

The liquid compressant used in the hydraulic brakes of the modern auto consists of equal parts of denatured alcohol and castor oil. The alcohol thins the oil and acts as an anti-freeze. The castor oil lubricates the piston and is the fluid through which the pressure is transmitted.

LIPSTICKS

Vaseline	15	oz.
Beeswax	10	"
Spermaceti	400	gr.
Carmine	6	dr.

Melt and stir. Allow to cool somewhat before adding perfume. Pour into moulds.

REFINING FISH OIL

351 M. A. K., Karachi—Wants to have a process of refining fish oil and a formula of floor cleaner.

The method of refining fish oil on a large scale is given below. Make a weak caustic soda lye by dissolving 8 oz. caustic soda in water. Stir this solution in half a ton of fish oil. Pass steam through the mixture for half an hour. Next dilute 1 oz. sulphuric acid with 3 lbs. of water and add to the blown oil. Boil the whole for 15 minutes and then allow to settle for half an hour. Run off the clear oil from the water and sediments into bleaching tanks. Now prepare a solution of bichromate of potash 4 lbs. in sulphuric acid 2 lbs. diluted with water. Add this to the above together with some nitric and oxalic acids. Again blow in steam through the whole mixture thereby thoroughly incorporating the added ingredients. Now pour in 1 lb. of nitric acid diluted with water 1 quart. Boil it again for half an hour. Then mix a small quantity of naphtha or spirit of turpentine. Finally wash the oil with hot water and allow to settle.

FLOOR CLEANSER

Pumice powdered	80	parts.
Soda ash	15	,,
Soap powder	5	,,

Mix. Sprinkle a quantity of the mixture over the floor and spray water over it. Then rub with a brush. Finally wash with water.

GALVANISING SMALL IRON ARTICLES

546 D. I., Manabalan—Wishes to have a process of galvanising iron articles by electroplating method.

The article to be galvanized is first cleansed with dilute hydrochloric acid, next rinsed off, then placed in a solution of zinc chloride or sulphate, and connected with the negative pole of a dynamo-machine. Zinc plates connected with the positive pole are suspended in the fluid and the machine is set to work. The surface of zinc produced in this manner is provided with a metall lustre by quickly moving the articles ov a fire, or placing them in a chamber suf ciently hot to melt the zinc. If at tl instant that this takes place, a stock is giv to the articles, the coating will assume tl spangled appearance so much sought after

GLASS ETCHING INK

432 B. C., Calcutta—Desires to kno a formula of preparing glass etching ink.

Hot water	12	p.c.
Ammonium fluoride	15	,,
Oxalic acid	8	,,
Ammonium sulphate	10	,,
Molasses	40	,,
Talc powder	15	,,

Mix all together. If the ink does n readily adhere to the glass, add an add tional very slight amount of water to redu the viscosity of the mixture. It is n advisable to add free hydrofluoric acid, this causes the ink to run and to blu The addition of about 2 p.c. of sodiu fluoride sometimes improves the quality the ink.

The glass should be slightly warme before writing upon it. Allow the ink t act for about 2 minutes, then wash o thoroughly with hot water and dry. Goo legible writing should be obtained easil in not more than 30 seconds when the glas is warm. Use an ordinary steel per Wash ink from pen when finish, keep thi ink in hard rubber or lead bottles.

DRILLING GLASS PLATE

608 M. A. L., Bombay—Wishes t have a process of drilling glass plates.

To drill a ¼ in. hole in a glass plate make a hole in a piece of wood or meta of the size that you desire to drill in th glass. Fasten it with beeswax upon th glass for a guide. A piece of brass coppe tubing, quite thin, is supplied with emer and water and twirled between the finger or with a bowstring. This will cut a hol in a few minutes. You can feed the emer and water a little at a time through the tube

GLAZED TILES

483 M. S., Mandvi—Wishes to have a process of making glazed tiles.

Glazed potteries are used in increasingly large quantities for decorative and hygienic purposes. In the manufacture of glazed potteries a glaze or glassy covering is essential as the body of unglazed ware is porous. The glazes are chiefly composed of some of the following substances: Borax, Soda, Potash, China stone, Flint, China clay, Whiting, and one or more lead copounds. As some of these substances are soluble in water, they could not be used in the ordinary methods of applying the glaze (*i.e.* by dipping), and such substances must, therefore, be converted into insoluble ones. This conversion is effected by fusing certain ingredients of the glaze together, thus forming insoluble silicates. This process is known as fritting, and the fused product is termed frit.

The following are typical mixtures for making frits for glazed potteries :—

Borax	30	parts.
China stone	30	,,
China clay	5	,,
Flint	15	,,
Whiting	14	,,
Soda ash	6	,,

The frit mxiture is placed in reverberatory kiln and, when fused, is run into water which granulates it.

The glaze is usually made of the following :—

Frit	50	parts.
China stone	25	,,
White lead	25	,,

The glaze mixture is ground with water to an extremely fine powder and then applied to already fired tiles by dipping into the glazed slip. The potteries are next allowed to dry and placed in saggers and fired until the glaze has fused to a uniform glassy covering.

GLUCOSE

577 C. C., Bangalore—Desires to know a process of preparing glucose.

Glucose is a crystalline hydrate melting at 86°C. Commercially it is manufactured from starch by heating with dilute mineral acids, when hydrolysis ensues. Mixed with a large amount of dextrin it comes into commerce; (1) as solid glucose; (2) as the viscid syrup known as " Starch Syrup."

The principle underlying its manufacture is as follows :—

The starch is placed in a boiler a small percentage (say ¼ per cent. or even less) of hydrochloric, sulphuric or hydrofluoric acid is added and the whole heated under 1-2 atmospheric pressures, cooled, and the acid neutralised. If hydrochloric acid is employed it is neutralised by sodium carbonate, the small percentage of sodium chloride produced being imperceptible to the taste; sulphuric acid is neutralised with calcium carbonate or chalk, the calcium sulphate, produced coming down as a precipitate. Hydrofluoric acid is completely precipitated as calcium fluoride.

LIQUID GLUCOSE OR STARCH SYRUPS

To prepare it moist potato-starch, carefully purified from nitrogenous matter is employed. 200 parts by weight of water and as much sulphuric acid as serves to make a 0.3 per cent. solution are placed in a leadlined vessel, and 100 parts by weight of starch (weighed dry) made into a milk with water are run into the boiling acid, so that the starch is almost immediately gelatinised. The mixture is then heated in a copper autoclave for one hour under 1 atmospheric pressure, so that about half of the starch is hydrolysed to dextrin and the rest to dextrose (or maltose). The process is finished when a portion gives no coloration with iodine—showing that all the starch has disappeared. The product is a non-crystallisable syrup having a density of 17°Be. The sulphuric acid is neutralised with calcium carbonate the solution filtered from the calcium sulphate, through a filter-press, and finally decolourised by filtering through animal charcoal, which simultaneously absorbs some of the finer particles of calcium sulphate. The syrup is now again concentrated in vacuum pans to 40°-45°Be and should be clear and colourless.

SOLID GLUCOSE

Solid glucose is manufactured in the same way as the syrup, but the hydrolysis in the autoclave is carried on for a longer time so that the resulting mixture contains almost twice as much dextrose as dextrin. The product, when filtered, decolourised and evaporated solidifies as a white mass of microscopic crystals, in which fine needles of dextrose hydrate may be seen embedded in syrup. The crystalline dextrose hydrate however, cannot be separated by ordinary means from the syrup.

IMITATION GOLD

486 D. L. W. M., Allahabad—Wishes to have formulas of making imitation gold and lubricating oil for watches.

Copper	90	parts.
Gold	2½	„
Aluminium	7½	„

Melt the copper and the gold in a crucible composed of refractory material or of a mixture of unburnt fire-clay and dust of fire bricks, glass pots or seggars and when the metals are fluid the aluminium is added. When not more than 2 lbs. of the alloy are made at a time the mass is kept in a fuse state for half an hour, about 1¾ oz. of borax being added as a flux. The melted mass is then poured into ingots.

GLUE TO FASTEN LINOLEUM ON IRON STAIRS

439 P. K. D., Rangoon—Wants a formula of glue to fasten linoleum on iron stairs.

I

Use a mixture of glue, isinglass, and dextrin which, dissolved in water and heated, is given an admixture of turpentine. The strips pasted down must be weighted with boards and brick on top until the adhesive agent has hardened.

II

Soak 3 parts of glue in 8 parts water, add ½ part hydrochloric acid and ¾ part zinc vitriol and let this mixture boil several hours. Coat the floor and the back of the linoleum with this. Press the linoleum down uniformly and firmly and weight it for some time.

BELT GLUE

A glue for belts can be prepared as follows : Soak 50 parts of gelatin in water, pour off the excess of water, and heat on the water bath. With good stirring add, first, 5 parts by weight, of glycerine, then 10 parts, by weight, of turpentine, and 5 parts, by weight of linseed oil varnish and thin with water as required. The ends of the belts to be glued are cut off obliquely and warmed ; then the hot glue is applied, and the united parts are subjected to strong pressure, allowing them to dry thus for 24 hours before the belts are used.

FIREPROOF GLUE

Raw linseed oil	8	parts.
Glue or gelatin	1	part.
Quicklime	2	parts.

Soak the glue or gelatin in the oil for 10 to 12 hours, and then melt it by gently heating the oil, and when perfectly fluid stir in the quicklime until the whole mass is homogeneous, then spread out in layers to dry gradually, out of the sun's rays. For use, reheat the glue in a glue pot in the ordinary way of melting glue.

CUTLERS' CEMENTS FOR FIXING KNIFE BLADES INTO HANDLES

Melt sufficient black rosin, and incorporate thoroughly with it one-fifth its weight of very fine silver sand. Make the pestle hot, pour in a little of the mixture, then force the handle well home, and set aside for a day before using.

PREPARATION OF COLOURS

FOR CERAMICS

452 R. M. L., Calcutta—Wants to prepare colours for ceramics.

The specified ingredients should all be obtained finely ground, and after being mixed in the proportions given should, in a seggar or some clay vessel, be fired in the brick kiln and afterwards ground for use. In firing the ingrediends the highest heat attainable is necessary.

TURQUOISE

Oxide of zinc	8	parts.
Oxide of cobalt	1¼	„

GRASS GREEN

Oxide of chrome	6	parts.
Flint	1	part.
Oxide of copper	½	„

ROYAL BLUE

Pure alumina	20	parts.
Oxide of zinc	8	„
Oxide of cobalt	4	„

MAZARINE BLUE

Oxide of cobalt	10	parts.
Paris white	9	„
Sulphate barytes	1	part.

RED BROWN

Oxide of zinc	40	parts.
Crocus of martis	6	"
Oxide of chrome	6	"
Red lead	5	"
Boracic acid	5	"
Red oxide of iron	1	part.

ORANGE

Pure alumina	5	parts.
Oxide of zinc	2	"
Bichromate of potash	1	part.
Iron scale	½	"

CLARET BROWN

Bichromate of potash	2	parts.
Flint	2	"
Oxide of zinc	1	"
Iron scale	1	"

CHROME GREEN

Oxide of chrome	3	parts.
Oxide of copper	1	part.
Carbonate of cobalt	1	"
Oxide of cobalt	2	parts.

OLIVE

Oxide of chrome	3	parts
Oxide of zinc	2	"
Flint	5	"
Oxide of cobalt	1	part.

BLOOD RED

Oxide of zinc	30	parts.
Crocus martis	7	"
Oxide of chrome	7	"
Litharge	5	"
Borax	5	"
Red Oxide of iron	2	"

BLACK

Chromate of iron	24	parts.
Oxide of nickel	2	"
Oxide of tin	2	"
Oxide of cobalt	5	"

IMPERIAL BLUE

Oxide of cobalt	10	parts.
Black colour	1½	"
Paris white	7½	"
Flint	2½	"
Carbonate of soda	1	part.

MAHOGANY

Chromate of iron	30	parts.
Oxide of manganese	20	"
Oxide of zinc	4	"
Oxide of tin	4	"
Crocus martis	2	"

SKY BLUE

Flint	9	parts.
Oxide of zinc	13	"
Cobalt	2½	"
Phosphate soda	1	part.

BLUE GREEN

Oxide of chrome	6	parts.
Flint	2	"
Oxide of cobalt	¾	part.

GORDON GREEN

Oxide of chrome	12	parts.
Paris White	8	"
Bichromate of potash	4½	"
Oxide of cobalt	¾	part.

VIOLET

Oxide of cobalt	2½	parts.
Oxide of manganese	4	"
Oxide of zinc	8	"
Cornwall stone	8	"

LAVENDER

Calcined oxide of zinc	5	parts.
Carbonate of cobalt	¾	part.
Oxide of nickel	¼	"
Paris white	1	"

BROWN

Manganese	4	parts.
Oxide of chrome	2	"
Oxide of zinc	4	"
Sulphate barytes	2	"

DOVE

Oxide of nickel	7	parts.
Oxide of cobalt	2	"
Oxide of chrome	1	part.
Oxide of flint	18	parts.
Paris white	3	"

YELLOW GREEN

Flint	6	parts.
Paris white	6	"
Bichromate of potash	4½	"
Red lead	2	"
Fluorspar	2	"
Plaster of Paris	1½	"
Oxide of copper	½	part.

WHITE COSMETIQUE

Jasmine pomade	2	ounces.
Tuberose pomade	2	"
White wax	2	"
Refined suet	4	"
Rose oil	15	minims.

Melt the wax and suet over a water bath, then add the pomades, and finally the otto.

REMOVER FOR CUTICLE

219 C. A., Badahore—Wants recipes of remover for cuticle beauty cream, etc

Sodium hydroxide	4	ounces.
Water	2½	gallons.

Dissolve these two items in a stone jar, to which add two ounces of glycerine and thirty drops of oil of rose geranium. If this mixture is then put in bottles having corks for stoppers, the corks should be dipped in melted paraffin wax.

BEAUTY CREAM

This formula gives the skin a beautiful, smooth, and fresh appearance, and, at the same time, serves to protect and preserve it.

Alum, powdered	10	grams.
Whites of	2	eggs.
Boric acid	3	grams.
Tincture of benzoin	40	drops.
Olive oil	40	,,
Mucilage of acacia	5	,,
Rice flour, quantity sufficient.		
Perfume, quantity sufficient.		

Mix the alum and the white of eggs, without any addition of water whatever, in an earthen vessel, and dissolve the alum by the aid of very gentle heat (derived from a lamp, or gaslight, regulated to a very small flame), and constant, even, stirring. This must continue until the aqueous content of the albumen is completely driven off. Care must be taken to avoid coagulation of the albumen (which occurs very easily, as all know). Let the mass obtained in this manner get completely cold, then throw into a Wedgwood mortar, add the boric acid, tincture of benzoin, oil, mucilage (instead of which a solution of fine gelatin may be used), etc., and rub up together, thickening it with the addition of sufficient rice flour to give the desired consistence, and perfuming at will. Instead of olive oil and pure fat, or fatty oil, may be used, even vaseline or glycerine.

FACE BLEACH OR BEAUTIFIER

Syrupy lactic acid	40	ounces.
Glycerine	80	,,
Distilled water	5	gallons.
Mix. Gradually add Tincture of benzoin	3	ounces.
Colour by adding Carmine No. 40	40	grains.
Glycerine	1	ounce.
Ammonia solution	½	,,
Water	3	ounces.

Heat this to drive off the ammonia, and mix all. Shake, set aside; then filter, and add

Solution of ionone	1	drachm.

Add a few drachms of kaolin and filter until bright.

COSMETIC JELLY

Tragacanth (white ribbon)	60	grains.
Rose water	14	ounces.

Macerate for two days and strain forcibly through coarse muslin or cheese cloth. Add glycerine and alcohol, of each 1 ounce. Perfume to suit. Use immediately after bathing, rubbing in well until dry.

CASEIN MASSAGE CREAM

The basis of the modern massage cream is casein. Casein is now produced very cheaply in the powdered form, and by treatment with glycerine and perfumes it is possible to turn out a satisfactory cream. The following formula is suggested :

Skimmed milk	1	gallon.
Water of ammonia	1	ounce.
Acetic acid	1	,,
Oil of rose geranium	1	drachm.
Oil of bitter almond	1	,,
Oil of anise	2	drachms.
Cold cream (see below), enough.		
Carmine enough to colour.		

Add the water of ammonia to the milk and let it stand 24 hours. Then add the acetic acid and let it stand another 24 hours. Then strain through cheese cloth and add the oils. Work this thoroughly in a Wedgwood mortar, adding enough carmine to colour it a delicate pink. To the product thus obtained add an equal amount of cold cream made by the formula herewith given :

White wax	4	ounces.
Spermaceti	4	,,
White petrolatum	12	,,
Rose water	14	,,
Borax	80	grains.

Melt the wax, spermaceti, and petrolatum together over a water bath; dissolve the borax in the rose water and add to the melted mass at one time. Agitate violently. Presumably the borax solution should be of the same temperature as the melted mass.

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

A TAILORING BUSINESS

119 R. B. P. S., Muzaffarpore.—Although there are a fairly good number of tailoring shops in my native town, I am of opinion that it can very well afford to have another. I am a native of this place, and know most of its inhabitants intimately. Do you advise me to start a tailoring business here ?

Answer :—There is no reason why you should not. Before advising you, however, more definitely on the subject, we would like to know if you have got any practical knowledge of tailoring. By this we mean (*i*) can you take measurements, and say the length of cloth necessary for an order which might be placed with you ? (*ii*) do you know the work of a cutter ? and (*iii*) are you competent to supervise efficiently the works done by the tailors you will have to engage in the establishment ? If you do not happen to possess these preliminary qualifications, we would advise you strongly to acquire them before starting your business. You may do so without any very great difficulty either by learning the craft from any one of the tailoring shops in your town, or, if that be not practicable, by learning it from any one of the "tailoring schools" of Calcutta. There are many such in that city, and the course of training does not extend more than six months. You may, if you are smart and active enough, master the details of the whole business, and although it would be idle to expect that you would acquire the dexterity of a first class tailor and cutter at the expiration of that period—for that requires a pretty long practice—you might certainly be able to supervise the works done by your assistants by receiving such a course of training. Obviously, you cannot expect to cope with the business without a staff (big or small) or assistants. These men are known sometimes to desert their masters without any previous notice, and if you yourself know the work, you are not likely to be stranded in the event of such a contingency occurring. Then again, it will be easier for you to exercise a thorough supervision over these by seeing that they do not rob you of cloth &c. and do their work properly. As you say you are acquainted with most of the inhabitants of your town, we gather therefrom that it will not be difficult for you to secure customers. But you must take care to let them know beforehand that you have started the business. For this purpose, you should distribute some handbills informing the inhabitants of your native town that you have started (or are about to start) the business, and are in a position to supply orders with the utmost punctuality. You must bear this in mind most carefully and make it a point always to deliver the things on the day fixed. Most of your success would depend on this. It will be also better for you to have some kinds of cloth in your shop such as are generally required by the customers in a tailoring establishment. This, besides enabling you to make some profit by their sale, would also save your customers a lot of worry. They would not be required to trouble themselves for the selection and purchase of the cloth required, from other establishments, before placing their orders with you. Needless to say, you will have to treat all your customers with the greatest courtesy and politeness (without being in the least servile). You should also instruct all your subordinates to observe this rule unswervingly. You might, at least in the beginning go about from door to door, soliciting and securing orders. You need not be at all anxious for the fact that your town is already provided with some tailoring establishments. As we have already had occasion to remark in these columns, the very fact that there are some such shops in your town is an argument in favour of the theory that you are likely to succeed, if you are otherwise competent.

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of Re. 1 stamps for each question. Subscribers outside India are requested to send eight International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

367 R. L. D. R., Kanpur—Keroclean is a non-inflammable cleanser which removes great spots from delicate fabrics without injury, cleans all kinds of jewellery and tableware by removing fats and tarnish kills moths, insects and household pests by suffocation and extermination, and cleans ironware by removing rust brassware by removing verdigris. It is as clear as water and will stand any fire test. Following is the formula of Keroclean: Kerosene 1 lb.; carbon tetrachloride 3 lbs.; citronella oil 2 oz. Mix and filter if necessary.

368 J. P. V., Aligarh—Stainless steel may be had of Tata Iron & Steel Co. Ltd., 102A, Netaji Subhas Road, Calcutta; Steel Corporation of Bengal Ltd., 12, Mission Row, Calcutta; Thermic Steel Co. Ltd., C-5, Clive Bldgs., 8, Netaji Subhas Road, Calcutta and Bombay Co. Ltd., Pollock House, Pollock Street, Calcutta.

369 M. D., Gauhati—For selling empty drums of 40 to 45 gallons capacity negotiate with oil mills. Following is a list of oil mills : Agnihotra Oil Mills, 37-1, Canal West Road; Ashutosh Oil Mill, 242, Upper Circular Road; Bhagat Oil Mills, 32/4, Sahitya Parishad Street; Dayal Chandra Sadhukhan Oil Mill, 242, Upper Circular Road; Ganesh Oil Mills, 46, Ultadanga Road and Hari Oil Mill, 243, Upper Circular Road; all of Calcutta.

370 R. K. T., Punalur—For battery machine write to Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; General Electric Co. (India) Ltd., Magnet House, Chittaranjan Avenue and Kaycee & Co. Ltd. Bharat Bhawan, Chittaranjan Avenue; all of Calcutta. For machine required for engraving on fountain pens write to Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

371 M. S. P., Anand—Following is a list of cottage industries which may be started on small scale with small capital : Boot polish, soap, toilet preparations, zarda, kimam, ink, rubber balloons, etc.

372 C. T., Kurnool—The materials used in the manufacture of printing inks may be divided into three main classes—vehicles, pigments and compounds. Each has its own specific purpose for employment. The vehicle, employed to maintain the consistency and tack of the ink, serves as a homogeneous dispersing medium of the pigment and checks the drying of the ink. The various oils are grouped into three subdivisions, oils of vegetable, mineral and animal origin. Linseed and chinawood oils are the widely used oils for the preparation of quality inks. The pigment besides stiffening the vehicle serves to give the vehicle capacity, tone and colour. The various pigments used fall into two broad groups the organic and the inorganic. Barring some naturally occurring inorganic pigments like sienna and certain ochres (for oxides), the various iron blues, chrome yellows, cadmium colours are specially prepared for incorporation into the vehicle. Salts of lead, manganese or cobalt in vegetable oils called driers are added to the vehicle to accelerate the drying of inks. Soap is incorporated so that the ink might leave the printing surface clean. Beeswax and petroleum are added to prevent sticking of printed sheets and off-setting. The substances referred to above employed to make up deficiencies in the vehicle or pigment are called "Compounds." However, care must be taken to see that all the constituents are properly proportioned lest the covering power or the drying time of the ink might not be affected. The following machineries and accessories are indispensable for the working of an ink factory : Grinding mill, mixing machines, standing kettles, electric motors, mixing machines, centrifugal machines, filter press, tanks, barrels, etc. For detailed information you may consult Technology and Manufacture of Printing Inks by G. N. Sarma, published from this office, price Rs. 3/12/- including postage.

373 B. R. M., Calcutta—Following is a formula of synthetic jasmine oil :

Benzyl acetate or oil of jasmine can be prepared with a mixture of 109 c.c. of benzyl alcohol (obtained by the action of potassium hydroxide on benzaldehyde and subsequent distillation), 60.5 c.c. of glacial acetic acid and 10 c.c. of concentrated sulphuric acid placed in a distilling flask of sufficient capacity and heated to the boiling point. At about 210°C a sweet smelling oil will distill over and collect in the receiving flask. This oil is a natural constituent of oil of jasmine, ylang-ylang and other flower oils.

374 P. R. S., Aligarh—We have no publication on washing, dry cleaning. For machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

375 D., Hubli—For hernia belt enquire of Deformity Appliances & Hospital Stores, 2, College Square East, Calcutta; Powell Ltd., Lamington Road, Bombay-4 and Orthopoedic Appliances Stores, 113, Chittaranjan Avenue, Calcutta.

376 R. S., Banaras—It is not advisable for you to leave the permanent job without making arrangement for earning at least the equal amount of salary you get if not more. You may start mail order business while continuing your permanent job. You should not start a shop until and unless you can devote whole time in your shop.

377 B. R. D., Asansol—Chemicals may be had of Bengal Chemical & Pharmaceutical Works Ltd., 94, Chittaranjan Avenue, Calcutta; B. K. Paul & Co. Ltd., 1 & 3, Bonfield Lane, Calcutta; Allied Agency, 16, Bonfield Lane, Calcutta and Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

379 R. C., Jaipur City—Following is a formula of blue fountain ink : Ink blue 4 oz.; gum arabic ½ oz.; carbolic acid ½ oz.; hot water 2 gallons. Mix and keep aside for a day. Then strain through cloth and put in phials.

381 A. N. F., Andheri—Process of manufacturing cheap washing and toilet soaps will be found in Manufacture of Soap published from this office, price Rs. 4/12/- including postage.

384 B. G., Hubli—To blue gun barrels, etc. dissolve 2 parts of crystallised chloride of iron; 2 parts solid chloride of antimony; 1 part gallic acid in 4 or 5 parts of water; apply with a small sponge, and let dry in the air. Repeat this two or three times then wash with water, and dry. Rub with boiled linseed oil to deepen the shade. Repeat this until satisfied with the result. Wants to be put in touch with the suppliers of butts (bottom stock of a gun made of wood).

386 K. B. R., Kurnool—Pictures may be had of Tower Halftone Co., 14C, Kapalitola Lane, Calcutta; A. K. Ghose & Sons, 161, Lower Chitpur Road, Calcutta; Modern Picture Publishers of India, Bombay-4 and Navalakhi & Co., Kalbadevi Road, Bombay-2. Picture frames may be had of B. N. Dass & Co., 8, Royd Street, Calcutta; M. N. Dey & Co., 12-11A, Lindsay Street, Calcutta-13; Maharaja Frame Works, Chickpet, Bangalore City; Sri Rama Frame Works, Chickmagalur, Mysore and Star Art Framing Works, 90, Medows Street, Fort, Bombay. Glass sheets may be had of Fotic Lal Seal & Sons 10, Swallow Lane and Calcutta Glass Syndicate, 19-4, Harrison Road; both of Calcutta.

388 D. P. M., Miranpur—In preparing scented hair oil you should use compound instead of mixing flavouring agents separately. You should leave the compound at least for a fortnight for maturing. It is very difficult to suggest any improvement in the compound quoted by you. You may however eliminate otto rose and use jasmine in its place.

390 C. K. R. S. R., Travancore—You may extract the scent of night queen flowers all-night when these blossom and produce delightful fragrance. You should adopt the process of distillation. For distilling apparatus enquire of Adair Dutt & Co. Ltd., Stephen House, 5, Dalhousie Square, Calcutta. You may use a small quantity of sandalwood oil to modify the perfume of night-queen flowers. No such apparatus is available.

392 B. V. V. N. D., Eluru—For selling bristles you may negotiate with the following firms : Indian Bristles & Lard Supply Co., 31-1, Tangra Road, Calcutta; Khaitan Sons & Co., 2, Dalhousie Square East, Calcutta and Mazumdar, 67B, Netaji Subhas Road, Calcutta.

393 I. S. C., Agra—Process of manufacturing blocks will be found in Independent Careers for the Young published from this office, price Rs. 3/12/- including postage. For camera and other accessories enquire of Photographic Stores and Agency Co Ltd., 154, Dharamtala Street, Calcutta.

394 U. C. D., Silchar—For small calendering machine enquire of W. H. Brady & Co. Ltd.. Mercantile Bldg., Lall Bazar, Calcutta.

395 V. B. V. R., Rajahmundry—Following is a formula of good quality disinfecting fluid: Rosin 10 lbs.; sulphonated castor oil 4 lbs.; caustic soda 1 lb.; caustic potash 1½ lbs.; chlorinated cresol 1½ gallons; chlorinated phenol ½ lb.; soft water 5 gallons. First of all dissolve the caustic soda and caustic potash in 2 gallons of water. Keep aside to cool. Next melt the rosin over slow fire and mix the sulphonated oil. Reduce the fire and slowly but continuously pour the alkali solution. Stir and heat gently until the soap is formed. Put down the fire and allow the mass to cool almost to room temperature. Then mix the chlorinated cresol and chlorinated phenol one by one. Stir and then mix the remaining three gallons of water. Keep in a well closed drum for a couple of days. Then fill the bottles.

396 U. C. P., Kamrup—You have to invest at least Rs. 10,000 for starting one of the following businesses: Umbrella manufacture, electroplating and bucket manufacture. Electroplating equipments and bucket making machines may be had of Alfred Herbert (India) Ltd. 13/3, Strand Road, Calcutta-1. Umbrella making materials may be had of Empress Mills, Nagpur; Sohonlal Mohonlal Ltd., 14/2, Old China Bazar Street and Gambhirchand Rathi, 39, Armenian Street, Calcutta.

397 R. S. B., Burdwan—Blocks may be had of Dass Brothers, 14, Garanhata Street, Calcutta; King Halftone Co., 22, Wellington Street, Calcutta; N. Dey & Co., 1/1, Bhim Ghose Bye Lane, Calcutta.

398 C. A. B., Bombay—Rubber solution is used in some quantity by the Cycle and Motor Tyre repairer and also in various trades as a waterproof varnish. In order to prepare this article fresh raw rubber cut in small pieces is placed in a bottle of naphtha or benzine in the preparation of 1 part of former to 5 of the latter. The rubber gradually swells absorbing the solvent and eventually loses its tenacity. Now the mass on vigorously stirring or the bottle on shaking at a certain stage and this treatment repeated from time to time, an apparently homogeneous solution is finally obtained. This rubber solution is very sticky and tenacious. But if the raw rubber is not fresh it is better to masticate it in a kneading machine whereby it is reduced to impalpable paste. Now take one part of this paste and put it into 5 parts of naphtha or benzine contained in a suitable bottle. Shake for a while. The rubber readily goes into solution into a less viscous mass than untreated rubber.

399 M. W. I., Nagpur City—To communicate with any querist write with number and initials care of Industry when your letters will be duly redirected.

400 K. P. S., Allahabad—Mustard oil is manufactured mainly in U. P., Bihar and West Bengal. Groundnut oil is manufactured in Madras State.

401 S. S., Anand—Following is a formula of strong pomade: Olive oil 10 oz.; spermaceti 3 oz.; oil of bergamot 2 oz.; oil of cloves 10 mins.; oil of rose-geranium 40 mins. Heat the olive oil and spermaceti together over a slow fire; then add the essential oil and put in mould.

402 B. R. P., Poona—Following is a formula of cold cream: Almond oil 10 fl. oz.; white wax 2¾ oz.; borax 3 dr.; water 5 fl. oz.; rose water ¾ dr. Melt the wax on water bath and to the melted mass add the oil and warm the mixture to 80°C. Now dissolve borax in hot water and heat to 80°C. When the above two are at 80°C take down the wax-oil mixture from water bath, slowly stir in the borax solution and continue stirring till the mass cools to 45-50°C. Then mix rose water and pour into containers.

403 K. R. J., Madras—Following is a list of ship builders: Alcock Ashdown & Co. Ltd., 16, Bank Street, Fort, Bombay; Calcutta Landing & Shipping Co., 24, Howrah Road, Salkia, Howrah; Garden Reach Workshops Ltd., 43-46, Garden Reach Road, Calcutta and I. G. N. & Railway Co's Dockyard, 44, Garden Reach, Calcutta.

404 M. M., Amritsar—Your enquiry appears in Trade Enquiry Columns.

405 F. L. S. M., Dacca—Following is a list of soap manufacturers: Asiatic Soap Co., 8, Dalhousie Square, East; Banga Laxmi Soap Works Ltd., 7, Chowringhee Road; Bengal Chemical & Pharmaceutical Works Ltd., 164, Manicktala Main Road; Calcutta Chemical Co. Ltd., 35, Panditia Road; Calcutta Soap Works, Calso Park, Tiljala; Nalanda Soap Works, 22, R. G. Kar Road; Sisir Soap Factory, 12/1, Jessore Road and North West Soap Co. Ltd., 63, Garden Reach Road; all of Calcutta.

406 S. S., Mannar—Plastic machines may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta. Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

408 N. C. B., Dehra Dun—Plaster of Paris is manufactured by Northern India Lime Marketing Association, Dehra Dun and Sree Nivas Chemical, Abdullapur. Ambala.

409 C. S. V., Daressalaam—For the machine required enquire of Marshall Sons & Co. Ltd., 99, Netaji Subhas Road; Francis Klein & Co. Ltd., 1, Royal Exchange Place and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, all of Calcutta.

410 J. B. S., Katmandu—For machine and equipment for welding enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta and Francis Klein & Co. Ltd., 1, Royal Exchange Place. Calcutta.

411 B. R. M., Calcutta—Following is a process of preparing artificial rose water: Rose oil 40 grams.; clove oil 4 grams.; alcohol to make 3½ fl. oz.; distilled water 35 fl. oz. Mix the first two ingredients and add alcohol to make 3½ fl. oz. Now mix the spirituous liquid with 35 fl. oz. of boiling distilled water and allow to stand until it has undergone the viscous fermentation and blend producing a stuff superior to most of the commercial waters. The above recipe avoids the necessity of distilling rose petals and yields rose water of satisfactory quality on simply mixing of the ingredients mentioned in the recipe.

412 L. M. C., Patna—For coconut oil enquire of the following firms: Adam Hajee Peermohamed Essack, 1, Amratola Lane; Dean Haji Pirmohamed Musa. 4, Amratolla Lane and Shakur Haji Gani, 10, Amratolla Lane; all of Calcutta. Caustic soda may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta and Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta. Soap-stone and sodium silicate may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta. Soap making machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

413 G. N. O., Madras—Groundnut oil as expressed from the seed is liable to contain mucilage and albuminous matters which produce turbidity in the oil. In order to remove these impurities filter the oil through a filter press; but before doing so treat the oil with 10 per cent of its weight of fuller's earth, which should be dehydrated by roasting prior to use. Mix thoroughly and then heat the mixture to 100°F and maintain the temperature constant for about 15 minutes. Lastly filter the oil through filter press. Thus a clear oil is obtained but the odour of the oil is somewhat earthy. To remove this bad odour wash the oil with 1 per cent solution of brine containing an equal amount of dry sodium bicarbonate.

414 P. L. S., Surat—Following is a list of motor car dealers: Asian Motor Car Co., Ram Chandra Mansion, Sandhurst Road, Bombay; Bombay Cycle & Motor Agency Ltd., 534, Sandhurst Bridge, Bombay-7; Car Mart Ltd., Pratt's Bldg., Hughes Road, Bombay; Ford Motor Co. of India Ltd., Swadeshi Mills Compound, New Queen's Road, Bombay-4; French Motor Car Co. Ltd., 9-11, Hughes Road, Bombay-7; United Motors (India) Ltd., Ford Bldg., Hughes Road, Bombay and Bombay Garage Ltd., 11, Elphinstone Road, Poona-1.

415 D. M. C., Allahabad—Artists' water colours may be prepared by grinding the respective pigments, previously reduced to powder into a smooth paste with equal weights of isinglass size and thin gum water. The paste is then compressed into squares as tightly as possible, and dried with a very simple heat. Old crumbling cake colours should be powdered very finely in a mortar, sifted through fine muslin, and ground up as above, the gum water being omitted. The powders, rubbed up with honey to the consistence of cream, constitute moist colours.

416 S. S. A., Bombay—Following is a formula of black stencil ink: Shellac 2 parts; borax 2 parts; water 25 parts; lampblack or nigrosine q.s. Boil the shellac and borax in water and then incorporate a sufficient quantity of lampbblack or nigrosine to give the desired colour.

417 P. C. B., Burdwan—Ice making machine may be had of Air Conditioning Corporation Ltd., 8, Netaji Subhas Road, Calcutta; M. Dhar & Co. Ltd., 175, Rash Behari Avenue, Calcutta; M.S. Vernal & Co., Bharat Insurance Bldg., Chittaranjan Avenue South, Calcutta and Sulzer Brothers Ltd., 8, Netaji Subhas Road, Calcutta.

419 B. K. J., Midnapur—Address of Investors Industrial Corporation is Mulad, Thana, Bombay State.

420 S. P., Siliguri—Candles are manufactured by Dipak Candle Manufacturing Co., 375, Upper Chitpur Road; Rupali Candle Works, 9, Mandal Street and United Manufacturers & Traders, 7, Hans Pooker Lane; all of Calcutta.

422 E. A. W. S. J., Madura—For resistance cords enquire of General Electric Co. (India) Ltd., Magnet House, Chittaranjan Avenue, Calcutta and Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta.

424 M. W. P., Chinsurah—We have no book dealing with dipterocarpus oil. We are not aware of any chemist expert in manufacturing hydraulic brake fluid.

425 A. B. D., Surat—For services of a chemist expert in making compound of night queen, green champa etc. advertise in newspapers. You may also communicate with P. C. Bhattacherjee. 16/1, Nandalal Bose Lane, Calcutta-3.

426 P. P. N., Rajapalayam—Process of Mercerising yarn appears in July, 1953 issue. Chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

427 A. M. B., Ramkola—We have no book dealing with the manufacture of table salt. To make table salt dissolve lump rock salt in four times its weight of water, filter and then drop into the filtered solution first chloride of barium and afterwards carbonate of soda as long as any precipitate falls. Then filter and evaporate the clear fluid very slowly, until crystals begin to appear. When this condition has been reached set aside the solution for a day. The crystals are taken out, dried and kept in bottles.

430 S. N. T., Shikohabad—For chemical analysis enquire of R. V. Briggs & Co. Ltd., 3 & 4, Garstin Place. Calcutta and Government Test House, Alipur, Calcutta.

431 S. A. C., Ramkola—For required gas plant you may enquire of Balmer Lawrie & Co. Ltd., 21, Netaji Subhas Road and General Electric Co. (India) Ltd., Magnet House, Chittaranjan Avenue; both of Calcutta.

433 B. D. C.. Kanpur—You may add 10 per cent alcohol for thinning castor oil. Following is a list of glass factories : All-India Glass Works, Nagina; Allahabad Glass Works, Naini; Jagdish Glass Works, Premnagar, Hathras; Naini Glass Works, 187, Bahadurganj, Allahabad and Star Glass Works, Near Railway Station, Firozabad.

434 K. M. R., Kanpur—Gut is usually bleached by sulphuration. The procedure is as follows : When sufficiently damp, the pieces are next exposed to the fumes of sulphur in a chamber about 5 feet square and 6 feet high. They are first strung on sticks and if not sufficiently moist they are sprinkled over with water from a brush; they are then suspended across the upper part of the chamber to the number of about 100 bundles. About one pound of flowers of sulphur is then put into an earthen dish placed on the floor of the room and upon this red-hot cinders are laid; the door is then quickly closed to retain the sulphur fumes within the apartment and every aperture is secured by heating or glueing pieces of paper over them. After a few hours the door is opened and the fumes allowed to escape when the pieces are found to be bleached and deprived of all objectionable odour. While still damp, they are twisted into hanks, packed with camphor and are then ready for market.

436 P. L. R. B., Amritsar—Chemicals may be had of Amar Nath Tandon & Sons, La Touche Road, Kanpur; Modern Traders Corporation, 24, Bhawan, Collectorganj, Kanpur; Pearl Products Ltd.. Anwargunge, Kanpur; Unique Chemical Co., 654, Grand Trunk Road, Amritsar and Shambhu Nath & Sons Ltd., P. O. Box No. 12, G. T. Road, Amritsar. For gold and silver thread write to Amritbhai Jethabhai, Mancherpura, Surat; Gokuldas L. Gandhi Jariwala, Khist Galli, Ahmednagar and Ranchhoddas Jagibandas, Moti Seri. Surat.

Trade Enquiries

(To communicate with any party write to him direct with name and address given below mentioning Industry.)

382 Shree Narayan Company, 174, Harrison Road, Calcutta-7.—Want to be put in touch with the suppliers of iron and manganese ores in Madras and Madhya Pradesh.

404 National Industries, Bazar Mai Sewan, Amritsar—Want to be put in touch with the suppliers of fittings for fountain pens such as clips, nibs, lever etc.

429 D. C. Jaidev Ahluwalia, Krishna Gali, Pathankot—Wants to be put in touch with the suppliers of lemongrass and rosagrass.

IMPORT OF SPARE PARTS OF MAJOR ITEMS AGAINST LICENSED ISSUED FOR THE IMPORT OF MAJOR ITEM ONLY

The following Public Notice (No. 147-ITC (P.N.)/53, dated the 21st November 1953) has been issued by the Government of India in the Ministry of Commerce and Industry :—

The attention of importers is invited to Public Notice No. 29-ITC (P.N.)/52 and 62-ITC (P. N.)/53, dated the 21st March, 1952, and the 11th April 1953, respectively, wherein the scope of the concession granted for the import of spare parts against licences issued for the import of certain major items has been defined. It has now been decided to extend the scope of the scheme to cover the following articles also. This article may be added to the list of eight already published in the public notices under reference which may be amended by the following addition :—

"(9) Stirrup pumps and trailer pumps falling under S. No. 81 of Part V of the Import Trade Control Schedule."

IMPORT OF BALL BEARINGS ABOVE 2" IN BORE (INTERNAL DIAMETER) FALLING UNDER SERIAL NO. 19 (1) (A) (V) OF PART II OF THE IMPORT TRADE CONTROL SCHEDULE

The following Public Notice (No. 148-ITC (P.N.)/53, dated the 21st November 1953) has been issued by the Government of India in the Ministry of Commerce and Industry : —

The attention of the importers is invited to the following remarks in the column against, Serial No. 19 (1) (a) (v) of Part II of the Import Trade Control Schedule in Appendix "A" to the Red Book for the July-December 1953 period.

"Not more than 10 per cent of the permissible value can be utilised for the import of any single type ball bearings specified in Appendix C(3). In cases, however, where the value of the quota licence is Rs. 2,000 or less, ball bearings of any single type can be imported to the extent of 20 per cent of the face value of the licence."

2. It has been decided to amend the above remarks as follows :—

"Not more than 20 per cent of the permissible value can be utilised for the import of any single type ball bearings specified in Appendix C(3). In cases, however, where the value of the quota licence is Rs. 2,000 or less, ball bearings of any single type can be imported to the extent of 40 per cent of the face value of the licence."

3. The Customs authorities have been advised to allow import of the additional quantity of the ball bearings in question accordingly.

DRAWBACK OF CUSTOMS DUTY PAID IN FOREIGN COTTON

The following Press Note, dated New Delhi, the 25th November 1953, has been issued by the Government of India in the Ministry of Finance Revenue Division :—

The Government of India have decided to allow, with effect from November 26, 1953, drawback of duty paid on foreign cotton used in the manufacture of cotton cloth with both warp and weft yarns of counts 40s and over, when such cloth or yarn is exported out of India.

A Notification in the matter has been issued under the provisions inserted in the Sea Customs Act by an Ordinance promulgated recently. The rules provide for payment as drawback of the entire import duty on raw cotton used in such cloth or yarn, i.e., at 2 annas 1-1/5 pies per lb. on the net weight (i.e. gross weight less tare viz. weight of paper, packing, etc.) of such cloth or yarn with a deduction of 15 per cent. in every case to cover the average weight of the sizing material contained in such cloth or yarn.

Government have also under consideration a scheme of refund in respect of cotton cloth and yarn, manufactured partly from imported and partly from indigenous cotton.

Tender Notices

SUPPLY OF SCIENTIFIC EQUIPMENTS

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SY-1/3953-D/1/1423.

Due by 10 a.m. on the 26th December 1953.

Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Ring and Ball, Softening point App, complete with accessories ..	1 set.
2.	Standard B. R. T. A. meter, electrically heated, complete with spare cup, two thermometers and one graduated receiver and accessories.	1 „
3.	Loss on Heat Test Oven, complete with 9 standard containers and accessories. ..	1 No.
4.	(*a*) Penetration Transfer Dish. ..	1 „
	(*b*) Penetration Tings, large ..	1 doz.
	(*c*) Water Bath ..	1 No.
	(*d*) Penetration Tings, small ..	1 doz.
5.	Analytical Balance and Weigh Box ..	1 No.
6.	Distillation Thermometers	
	(*a*) For Tar No. T4C ..	2 Nos.
	(*b*) For Bitumen I. P. Standard No. 6W-2 to 400°C. ..	2 „
7.	Standard Sieves B. S. with lid and cover ..	2 sets of 8 sieves and lid cover.
8.	Aggregate Impact Test Machine and Accessories. ..	1 No.
9.	Aggregate Crushing Value Test Apparatus and Accessories. ..	1 „
10.	Measurement of Aggregate Shape—	
	(*a*) Thickness Gauge ..	1 „
	(*b*) Length Gauge ..	1 „
11.	Dory Abrasion Machine with 6 shipholders ..	1 unit.
12.	Gallenkamp E. V. T. Viscometer, electrically operated, complete with accessories ..	1 set.
13.	Avery's Semi-automatic Balance 7 kg. capacity chart-0-100 gm. by 1 gm. div. fitted with stainless steel scoop and weights	1 „

Price per tender set .. .. Rs. 3-0-0

SUPPLY AND ERECTION OF COMPLETE SEWAGE DISPOSAL PLANT

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SP-1/3151-D/III/53.

Due by 10 a.m. on the 22nd. January 1954.

Sealed tenders are invited for—

Item No.	*Description of Stores.*	
1.	Supply and Erection of Complete Sewage Disposal Plant including all mechanical and electrical equipment and construction of all civil engineering works. ..	Price per tender set

INDUSTRIAL PRODUCTION

Industries		1952	Jan., to June, 1952	Jan., to June, 1953*	May, 1953*	June, 1953*	June, 1952
Major Industries.							
Coal	lakh tons	362.22	186.8	185.98	31.96	29.11	28.49
Steel	lakh tons	15.78	7.80	7.83	1.25	1.25	1.18
Yarn	million lbs.	1,448.30	683.6	736.0	124.0	125.0	113.7
Cloth	million yds.	4,603.20	2,162.8	2,453.6	423.0	418.0	377.8
Cement	lakh tons	35.37	16.8	17.85	3.24	3.20	2.76
Paper	tons	1,37,504	67,189	66,579	11,013	10,257	10,300
Matches	cases	6,08,200	3,01,300	3,13,100	52,500	51,100	50,800
Sugar	lakh tons	14.19	11.62	10.58	0.34	0.02	0.27
Engineering and Electric Industries.							
Machine tools	value in lakhs of Rs.	44.37	25.40	21.13	4.31	3.60	3.61
Electric lamps	lakhs	208.81	100.16	98.89	17.38	15.28	14.69
Dry cells	crore Nos.	13.02	6.42	6.85	1.19	1.28	0.70
Transformers	k.v.a.	2,14,800	98,700	1,48,400	24,900	26,100	16,400
Motors	h.p.	1,57,600	79,800	88,400	14,800	14,300	10,900
Electric fans	Nos.	1,95,500	1,11,100	1,00,700	19,700	19,700	18,100
Radio receivers	Nos.	71,495	34,481	30,757	5,587	5,959	4,845
Storage battery	Nos.	1,58,400	94,600	80,800	17,200	17,000	13,900
Cables and wires—							
Copper conductors	tons	5,928	1,687	4,855	949	795	311
Winding wires	tons	398	235	135	10	12	26
Rubber insulated cables and flexibles	lakh yds.	328.6	158.7	240.7	49.0	43.2	21.4
Insulators—							
H. T.	Nos.	3,25,000	1,69,700	2,20,400	33,300	42,000	9,300
L. T.	lakh Nos.	30.50	16.14	8.83	0.49	2.20	2.71
Chemical Industries.							
Salt	lakh mds.	768.64	604.65	721.72	229.18	156.19	148.71
Caustic soda	tons	17,058	8,004	8,978	1,344	1,639	1,122
Soda ash	tons	44,322	17,429	27,721	4,797	4,612	2,767
Chlorine liquid	tons	6,240	2,860	3,409	561	593	490
Bleaching powder	tons	792	441	687	166	155	74
Bichromates	tons	1,463	746	1,057	107	186	91
Sulphuric acid	tons	96,081	43,461	46,259	7,500	7,900	8,586
Superphosphates	tons	46,650	22,217	16,119	4,300	2,900	5,779
Non-ferrous Metals—							
Aluminium	tons	2,566	--	1,704	291	316	352
Antimony	tons	184	--	50	15	15	—
Copper	tons	6,079	—	1,374	—	499	502
Lead	tons	1,132	--	764	200	140	85
Miscellaneous (Minor) Industries.							
Sewing machines	Nos.	50,045	25,719	28,510	4,473	4,165	3,900
Hurricane lanterns	lakh Nos.	35.23	17.28	20.14	3,34	3.95	3.10
Bicycles	Nos.	1,96,956	75,919	1,03,761	19,710	23,104	17,778
Cycle tyres and tubes	lakh Nos.	83.55	39.24	43.60	8.00	8.32	7.51
Motor tyres and tubes	lakh Nos.	13.83	7.55	6 74	1,27	1.35	1.00
Cigarettes	crore Nos.	2,058 85	1,021.97	999.96	201.20	159.72	142.87
Plywood—							
Tea chests	lakh sq. ft.	782.27	432.26	272.77	39.74	50.00	65.73
Commercial	lakh sq. ft.	122.58	55 14	72.40	11.28	10.00	9.18
Refractories	lakh tons	2.43	1.25	1.13	0.17	0.20	0.21
Abrasives	reams	55,000	18,000	29,900	5,100	5,200	3,800
Sheet glass	lakh sq. ft.	90.42	48.9	118.26	9.86	10.00	—
Woollen manufactures	lakh lbs.	166.68	67.36	78.43	13.43	14.75	11.81
Footwear—							
Western type	lakh pairs	33.67	16.95	16.92	3.08	2.51	2.57
Indigenous type	lakh pairs	18.06	10.02	10.10	1.67	1.61	1.54
Alcohol —							
Industrial	lakh galls.	68.45	34.16	26.37	6.00	3.20	5.74
Power	lakh galls.	77.42	42.26	42.66	7.56	7.44	6.71

Figures are subject to revision month to month. * Provisional.

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ADVERTISEMENTS under this head of small announcements cost 4 As. per word, minimum Rs. 3 payable by Postage Stamp or M.O. with order. No vouchers given.

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Bottles & Corks
Brass Component
Brushes
Button & Ivory
Carbon Brushes
Cardboard Boxes
Chemicals & Minerals
Cinema Distributors
Crude Drugs
Cycles & Cars
Cutlery
Dental & Optical Materials
Educational & Instructions
Expert Wanted
Filter Paper
Financial
Floors & Floor Covering
Foods & Provisions
Fire Clay
Fire Bricks
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AGENTS WANTED

"Bengal Leather Industries, 10/C, St. James Square, Calcutta. Wanted Stockist-agents for Indian & export quality hand-designed ladies bags, dollar cases, moneybags, camel leather goods etc." (24-18 AA)

D. D. Malam—A Soothing Ointment for all Skin Diseases, never stains on clothes. Wanted Agents, Mahatma & Co., Jorasanko, Calcutta 7. (16-306 AA)

For "Organisers and Agents" on suitable terms, apply Oriental Provident Insurance Ltd., 10, Clive Row, Calcutta. Phone Cal. 7175. (19-77 AA)

Wanted:—Wholesale Dealers for our own make first class 'Mullick" Brand Rotary Treadle Sewing Machines. Thousands are already in actual use with reputation. K. C. Mullick & Sons, Ltd., 77-18, Dharamtalla St., Calcutta. (34-26 AA)

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B. S. Malam for all Skin Diseases—an infallible remedy. Wanted Agents. Biswa Santi & Co., 7, Mominpur Road, Calcutta 23. (16-329 AA)

AGENTS WANTED.

"1000 Advertisement Calenders 1954. Rs. 7/-, Posters Hindi, English or Urdu Rs 5/-. Agents wanted. Ajmerigate Press, Delhi 6. (16-182 AA)

Wanted Agents and Stockist for own made "Tropical" brand Goggles and Spectacle frames. Apply for terms United & Co. 1/1A Subol Chandra Lane Calcutta 9. (24-348 AA)

Wanted Distributors for our Famous "Five Fish" Mosquito Coils. Manufactures Orient Insecticide Company, 7/5A, Beadon Street, Calcutta 6 (17-356 AA)

AGENCIES WANTED

"Reputed firm solicits representation of reliable manufacturers for Bombay Please contact with particulars. Eastern Commercials, 16 Paley Sadan, Jerbai Wadia Road Parel, Bombaby 12" (24-233 AG)

BOTTLES & CORKS

Nath & Bros., 67, Ezra Street, Calcutta. Dealers in Empty Bottles, Phials, Corks. (12-25 BC)

Bhagya Laxmi Glass Agency, P-33, Pollock Street, Calcutta—1 Dealers in all sorts of Bottles, Phials, Corks, Caps, Capsules, Homeo phials, Glasswares, etc. (22-23 BC)

Krishna Silicate & Glass Works, Ltd., 17, Radhabazar St., Calcutta. Manufacturers of Bottles and Phials of every description. (16-24 BC)

Bimal Bottle Stores Ltd., 130, Radhabazar St., Calcutta. Dealers & Importers of empty Bottles, Phials, Homoeo Phials, Glasswares & Corks of all description. (20-20 BC)

Dilip & Co., 9, Pollock Street, Calcutta 1. Dealers in Bottles, Phials, Corks, Homœo Phials, Glasswares, Fancy Bakelite Caps, Etc. (18-28 BC)

Ashini Kumar Dass & Co., 180, Lower Chitpore Road, Calcutta, Phone B.B. 5598. Importers of Bottles, phials, corks, capsules, etc. (16-326 BC)

Sena Glass Agency, 60, Ezra St., Calcutta 1, Dealers in Soda water Bottles, pints, phials, carboys, Capsules and Corks. (17-352 BC)

The Glass Supply Agency, Dealers in all kinds of empty glass bottles, phials, corks, Bakelite caps, etc. P-33, Pollock St., Calcutta 1. (21-356 BC)

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Universal Cardboard Box Factory, 51, Ezra Street, Calcutta. For cardboard boxes, boards. **Our new developments** Printing & Block-making (16-95 CB)

CARBON BRUSHES

The Calcutta Carbon-Brush Manufacturing Co., Post Box No. 2495, Calcutta Importers and **manufacturers** of Carbon-Brushes Telegrams:— **Calcarb.** (16-41 CB)

CRUDE DRUGS

Bansidhur Dutt, 126, Khongraputty Street, Calcutta Botanical Crude Drugs, Spices, Gums, **Waxes,** Starch, Poisons, Heavy Chemicals. (17-17 CD)

Bengal Herbs Stores, 2 Mullick Street, Calcutta-7 Ashoke Bark, Rawlfiaserpentine, and **Indian** & Foreign Botanical Herbs. (14-21 CD)

P. C. Dawn & Co., 1, Machuabazar Street, Calcutta. Botanical Crude Drugs for Allopathic **Homoeopathic,** Ayurvedic & Hakimi Medicines (14-19 CD)

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We Make Machines for Making — Soap, lozenge, Biscuit, candle, Tablet, Ointment, Nail, **Tile,** Toys, Buckets, Tin-containers Cardboard **Box,** etc, also Printing, Book Binding, Agricultural, Wood Working, etc, Machines. Oriental **Machinery** Supplying Agency, Ltd P-12, Mission **Row** Extension, Calcutta 1. (30-71 MA)

For Plastic, Soap, Lozenge, Biscuit, Candle, Machine and Dies Write to M/s [illegible] **Machinery** Works, 25, Seven Tank Lane **Calcutta 30** (16-136 MA)

Best Machines in the Market—Build your career with industrial machines manufactured in our factory under expert supervision. These include machines for the manufacture of Soap, Lozenges, Biscuits Chocolates, Tablets, Pharmaceuticals, Chemicals Paints and Pastes, Chalk Sticks Sealing Wax Candle Mould Envelopes Lathes, Lathe Chucks, Drills and others machine shop tools and appliances etc, etc. Our machines will turn out Standard Products and run smoothly for long years without troubles **Small machineries Manufacturing Co., 22,** R. G Kar Road, **Shambazar, Calcutta. Phone** : B.B. 3858. 124 MA

MEDICINES

D. D. Eye Lotion—A Soothing Lotion for early relief of Sore-eyes, of **watering discharge,** grittiness, redness etc. **of eyes. Mahatma &** Co., Jorasanko, Calcutta 7. (18-306 MD)

PATENTS & TRADE MARKS

Dutt & Co., Patent Design and Trade Mark, Agents. Prompt and **efficient services guaranteed,** 82, Harrison Road, **Calcutta. (15-74 PT)**

Dewan Rajkumar, Trade Mark and Patent Attorney, Podar Chambers, Fort, **Bombay for** prompt service. **Main Trade Marks Registry is** in Bombay. **(20-83 PT)**

For Registration of Trade Mark, Name, designs and labels etc. **Write to** the Calcutta Registration Agency, 39, Neogipukur Lane, Calcutta 14. (Estd. 1921). **(12-81 PT)**

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Sheffield Spring & Steel Co., 135, Canning Street, Calcutta. Springs of all **kinds and** Machines parts Phone: Bank 3974, **Telegrams:** shessko. **(16-78 SR)**

Modern Engineering Works—Manufacturers of Springs & Spring Washers—Govt. & Rly. Suppliers. 12, Jadu Pandit Road, Calcutta 6. **(16-7 SR)**

For quality springs, enquire of British India Spring & Steel Co., 67B, Netaji **Subhas** Road, Calcutta 1. **Telegram—Springsman. Phone** Bank 3154. **(18-16 SR)**

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New Bengal Tea Co., P221/1, Strand Bank Road, Calcutta. **Wholesale dealers in tea Telegram:—"BANGLACHA." (14-65 TC)**

Bhuttacharya & Co., Ltd. Blenders and Exporters, Tea-merchants, **Proprietors of famous** Bhuttacharya's **Teas, 57, Cornwallis Street, Calcutta 6. (13-89 TC)**

TIN BOXES

Bengal Tin Box Mfg. Co., Ltd., 1, Jadu Mitter Lane, Calcutta—4. **Phone** B.B. 3030, **Manufacturers** of **Printed Tin Containers of all descriptions. (12-72 TB)**

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If it is Superb Hosiery come to us. We distribute them wholesale, **S. C. Lahiri & Co., 88, Cross Street, Calcutta. (19-75 WA)**

A Monthly Magazine for Manufacturers and Businessmen.

Editor: K. N. BANERJEE.

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107, STRAND, LONDON W.C. 2.

CONTENTS FOR NOVEMBER - DECEMBER, 1953

Contents for JANUARY ISSUE

January issue of Industry will contain useful articles on industrial and technical subjects such as Modern Process of Canning; Manufacture and Uses of Micanite; Manufacture of Special Kinds of Paper; Manufacture of Glass Tubing and Rod; Modern Hair and Scalp Preparation; The Indian Economy in 1952-53 in addition to the regular features such as Agricultural Tips; Scientific Researches and Inventions; Engineering Notes; The Business World; Official India; Pharmaceutical Recipes; Recipes for Small Manufacturers; Formulas Processes and Answers; Reader's Businees and Queries and Replies.

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Advertisement rates for ordinary and special position, both casual or contractual, are sent on request.

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All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

All enquiries regarding the Subscription or Advertisement Departments should be addressed to the General Manager.

OFFICE HOURS.

Editorial Department: 11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays

Subscription and Advertisement Department: 10 A.M. to 5 P.M. on weekdays and 10 A.M. to 2 P.M. on Saturdays.

PROBLEMS OF RURAL ECONOMY

The Presidential address, delivered by Mr. V. T. Krishnamachari, Planning Commission's Deputy Chairman, at the 14th session of the conference of the Indian Society of Agricultural Economists, recently held at Jaipur, ought to go down as a brief but knowledgeable account of the varied problems of India's rural economy. The problems on which he focusses attention are not of a recent origin. They were mostly created by the British who sought to perpetuate the poverty and backwardness of our rural population with a view to exploiting our resources of raw materials out of which they could manufacture goods and articles to be dumped into their eastern markets. Now that India is free, she cannot tolerate the continuance of this sickening phenomenon and, commendably enough for those who want rural India to come into her own, is dead set on resuscitating our rural economy as the foundation of a new Welfare State which already is in the process of being built. We can, for instance, refer to the rural bias with which the Five Year Plan is shot through and through. Other instances of officialdom's significant concern for the betterment of the existing poor lot of our villagefolk, selected cursorily, cannot but include the formulation of Community Projects, which are also being implemented; efforts to extend Reserve Bank's credit to the rural areas; suggestions to create a land army; the grant of rewards to the most efficient cultivators; the decision to embark upon a countrywide programme of rural education: and last but not the least, the setting up of the National Extension Service. Mr. Krishnamachari cannot be accused of resorting to a hyperbole in his estimate of the service as "the symbol of the Welfare State put into action."

Not all within the country seem to have felt happy over the pronounced rural bias of the Five Year Plan and its tributaries. They have even gone to the length of contending that the Government is out to develop our rural economy at the expense of the urban. However understandable their grievances, it is time they realized their mistake in insisting on the development of large-scale urban industries, while the standard of living of our many millions of villagefolk remained abominably low. The problem that ought to merit our attention first, is thus the most pressing one of liquidating urban poverty. It is no use trying to step up the production of those goods which will not sell on account of our villagefolk's low purchasing power. Obviously, the Government is doing first things first by bestowing its valuable attention on rural reconstruction and development.

The authors of the Plan believe, and rightly so, that a prosperous village economy is the real rock on which we should build the edifice of our future economic order. By no means untenable is the charge that the Government has neglected the cases of urban industries by confining them to the private sector which is now having a full measure of the tumble of uncertainties. Even so, the Government seems to have done first things first on the industrial front by bestowing its immediate attention on rural industries. Not that they are enough for us, but we have to key up their development before we are in a position to expand as well as intensify our urban industries. Develop the latter we must, but let us not build on sands.

As estimated by Mr. Krishnamachari, over 70 million of our rural families are cultivating about 250 million acres of land. Holdings are fragmentary in nature and not more than 20 per cent of land under cultivation is double-cropped or irrigated. Already the pressure of population on land is too high and about 3 million persons are added to it every year. Our villagefolk's standard of living is very low and unemployment and underemployment have gripped many of them. The wastage involved is both economic and human. That is why the Planning Commission has sought a solution for Indian economy by the following methods :—

(1) Application of research to agriculture with a view to promoting a system of intensive farming and the evolution of a diversified economy by means of co-operative effort ;

(2) Providing subsidiary occupations to the surplus labour force by encouragement of industries ;

(3) Application of the co-operative principle ; and

(4) Promoting the motive force for improvement through the people themselves.

Whether or not the above methods are sufficient for the purpose of raising our rural economy to the desirably high level, may be debatable. But their urgency cannot be doubted. Scientific research, if pursued with deserving care and in a spirit of earnestness cannot but yield fruit, provided its results are made available to agriculture for its use. Part of the problem is technical and so the scientist must come forward and tell us what we should do to increase the fecundity of the land. It is heartening to note that to-day both Government and the people have taken up the matter of intensifying rural production in an enthusiastic manner.

Extension of the land under cultivation also is taking place by efforts to clear jungles and tap available fallow lands with a view to growing food and money crops thereon. The importance of placing the country's co-operative movement on a sound footing cannot be overemphasized. Far too many people depend on agriculture at present. Then again, cultivation is of a seasonal nature and it cannot provide gainful occupations to the rural folk throughout the year. The village industries, therefore, should be helped on to their feet to enable our village people to escape from the evil of unemployment as well as under-employment. The question is not merely that of reviving the decaying small industries of the countryside but of modernising them to bring about quantitative as well as qualitative improvements in their output. Caution needs to be exercised to see that village and urban industries do not engage in querulous competition which may prove harmful to both, but develop in a harmonious manner. That officialdom has not always succeeded in keeping this aim in view is proved by what has gone down as the mill-handloom controversy and by the protests of the millowners against the Government's alleged policy of promoting the development of the handloom industry at the expense of the mill industry.

The National Extension Service has been created for helping the reorientation of our village economy in a systematic manner. The village level worker is the link between the Government and the villager and a guide to whom the villager looks for advice and for the supplies and services needed for implementing the rehabilitation programmes. Referring to the credit facilities made available by the Central Government to facilitate the introduction of the new order of things, Mr. Krishnamachari says that the Central Government has undertaken to assist State Governments with grants of half the additional cost of setting up Extension staffs and also to make efforts to find by the end of the Plan period short term credit for Rs. 100 crores a year, medium-term credit of Rs. 25 crores a year and long-term credit of Rs. 5 crores a year through the co-operative movement and other agencies.

Irrigation and power projects under the Plan will cost Rs. 600 crores. The accompanying extract from Mr. Krishnamachari's address gives details of the projects :

"5000 tubewells are to be constructed during the Plan period which will irrigate 1.5 million acres. The Planning Commission has also recommended a 15-year programme which would double the area under irrigation and increase electric energy about five times. A Technical Committee has been set up to examine projects for inclusion in the Five-Year Plan."

UNEMPLOYMENT STATISTICS

The West Bengal Government Statistical Bureau recently carried out a survey of the problem of unemployment in Calcutta (excluding the Tollygunge Municipal area). The first interim report of the sample survey states that 170,700 or 28 per cent. of the 615,500 families in the city are affected by unemployment, either wholly or partially. Needless to mention that the above figures make a very sad commentary on the existing state of things in India's industrial Capital, the darkest spot in the picture being unemployment among middleclass Bengali families 44 per cent. of which are affected by this major malady. We call unemployment a major malady because no other problem than this one paralyzes humanity to a greater extent. There is acute unemployment among the Bengali working class too, 31 per cent. of whose families have now passed under its sway. Among other language groups, 15 per cent. of Hindusthani and Oriya families, 18 per cent. of families speaking South Indian languages, 19 per cent. of those speaking other Indian languages, 14 per cent. of those speaking English and 13 per cent. of those speaking other foreign languages, have been affected by unemployment. Middleclass unemployment among Calcutta's inhabitants, though very acute among the Bengalis has lightened its grip over other language groups, the overall percentage of families thus affected being 38.

The working class families of different language groups have been affected by unemployment in the following manner:— Bengali, 31 per cent.; Hindusthani, 16 per cent.; Oriya, 9 per cent.; South Indian, 18 per cent.; other Indian, 24 per cent.; English, 29 per cent.; other non-Indian languages, 13 per cent. On the whole 22 per cent. of the working class families are affected.

To certain other figures collected by the West Bengal Government Statistical Bureau we are referring below and all we would like to point out for the present is that though we do not belittle the need for statistical information, it can help butter nobody's parsnips unless authority thinks out a remedy and applies it without any further delay. Poverty and unemployment are the worst enemies of democracy in as much as they provide a lever to those whose professed aim is to undermine it at the opportune moment. Things being allowed to drift for some time more, unpleasant occurrences may not be unlikely.

Of the total of 615,500 families, as many as 170,700 (28 per cent.) suffer from unemployment, having at least one person in each of the families who seeks employment. Of the total number of affected families, Bengalis, who constitute 50.7 per cent. of the population, contribute 70.2 per cent. (119,900 families). Hindustanis contribute 20 per cent.

If only the middle class of all language groups is taken into consideration, the contribution of the Bengalis, who constitute 77.8 per cent. of this class, to the total of unemployed in the group is even higher, namely, 90.7 per cent. Hindustanis contribute 4.7 per cent.

The contribution—49.3 per cent.—of the Bengali working class, who form 34.5

per cent. of the total number of persons in this class, to the total of unemployed in this group is also proportionately much higher than the contribution of those speaking other languages. Hindustanis contribute 35.5 per cent.

Of the total number of families affected by unemployment, 86,400 are middle class and 84,300 working class.

AUTOMOTIVE INDUSTRY

Addressing the Automotive Manufacturers' Association of India in Calcutta on December, 21 last, Mr. B. M. Birla expressed the hope that an Indian vehicle with all its important components manufactured in the country would be on the road in the next three years. That this hope is well warranted is proved by the efforts now being made by the Indian automobile industry to attain self-sufficiency. Mr. Birla welcomed the policy of the Government to encourage the industry by restricting imports, adding that it was necessary to make the policy by eliminating the imports of components for assembly in the country. As correctly estimated by him, there is less incentive to manufacture if imported parts are available and the manufacturer gets no return for his effort, enterprise and large investment. The production position of the industry is not so bad at the present moment. But demand for cars within the country should be made to rise or the industry could never come into its own. According to Mr. Birla, there is in the country a limited market of 10,000 to 12,000 motor vehicles a year while the manufacturing capacity of the two manufacturers already in the field is almost 60,000 motor vehicles. Mr. Birla thinks that the demand for motor vehicles is limited largely on account of the abnormally high incidence of taxation and the transport policies of State Governments. Motor vehicles are paying Rs. 60 crores as taxes every year to the Government.

The State Governments have resorted to policies which discourage greater use of motor vehicles. Criticising the nationalization policy of some of the State Governments Mr. Birla pointed out how on account of it a large number of private operators belonging to the middleclasses who used to invest their small savings on transport vehicles, had been ousted from the field of motor transport. Referring to the present fad of some of the State Governments to monopolize road transport by putting their own vehicles on the road and by crippling private-owned motor transport, Mr. Birla said that the high operating costs of the State transport organizations did not enable them to earn any profit. The cost of transport to the consumers was going up and there were no resource left for further expansion. Yet, regretted Mr. Birla, nationalization was being sustained at the expense of the tax-payer who could not possibly afford to feed State revenues indefinitely for such enterprises. The present transport system obtaining in India is not very satisfactory. The railsystem is riddled with defects which will take long to be liquidated. In the circumstances the Government or Governments concerned ought not to have embarked upon a policy which aims at stifling road transport.

The motor car industry and road transport here are still in a nascent stage and yet it is providing employment directly or indirectly to about 500,000 people. It can go down as the largest single employer in the country next only to the railways. Obviously, therefore, the automotive industry should be helped on to its feet by the combined efforts of manufacturers and the Government not only

because we have to reduce our foreign exchange expenditure by dispensing with the imports of motor parts but also because there is reason to think that if the industry is allowed to come into is own, it will go a long way towards minimising the acuteness of the unemployment problem now confronting us.

INK INDUSTRY

The Government of India have decided to withdraw tariff protection now being enjoyed by the country's fountainpen ink industry with effect from January, 1954. The indigenous fountainpen ink manufacturers feel concerned at this step. Withdrawal of protection may exercise a very baneful effect on the Indian ink industry and it is feared that competition may cripple it to a very great extent.

Protection was granted to the industry at a time when it was well beyond its capacity to face the competition offered by its better placed foreign rivals. Even so, the aim of protection was defeated by the permission granted to foreign capital to undertake manufacture of pen inks within the country. The liberalised import licensing policy adopted at a later date further weakened the indigenous industry's capacity for competition. The decision to withdraw protection is very ill-timed and there is reason to think that even if the import policy continues to be austere as at present, the foreign companies who have entered our markets by setting on foot the manufacture of inks on the soil of this country will ultimately swallow up their indigenous opposite numbers.

The Ink Manufacturers' Association claims that the fountainpen ink industry, which was on the point of extinction some years ago on account of unrestricted imports of foreign made inks, has made some progress during the last three years during which it has been enjoying protection. But three years is not sufficient time to permit the development of a nascent industry to any appreciable extent, and so the Association has requested the Government to revise their decision in favour of further extension of tariff protection to the pen ink industry. It is good that both Government and the Tariff Commission have recognised the progress made by the industry with respect to rated capacity and volume, variety and quality of fountainpen inks manufactured since the grant of protection. But in order to place on a firmer footing the Government ought to assist it further in the procurement of raw materials at cheap prices. Exclusive consumption of indigenous pen inks by the Government is urged as also complete ban on the import of foreign inks and elimination of differential privileges arising from the use of established foreign trade names. The country's consumers too have a duty by the industry. They must be prepared to replace their use of foreign inks by that of the indigenous varieties quite a good few of which seem in no way inferior to the imported brands.

W. B. GOVT.'S FOOD POLICY

The West Bengal Government's deicision not to allow wholesale dealers to buy rice in the districts after December, 31, came in for trenchant criticism in the hands of Mr. U. K. Das, President of the Calcutta Rice Wholesalers' Association, at a Press conference recently addressed by him. He said that such a decision would work against the interests of both consumers in Calcutta and the industrial area and of growers. Consumers, he said, would be deprived of good quality rice and

the growers, in the absence of competitive buying, would not get remunerative price for the grain. Mr. Das disclosed that rice for the market shops would have to be procured from Nepal, Burma, Thailand and other foreign sources and it is quite poor in quality and much dearer than the rice obtained internally.

Mr. Das also focussed attention on what may well pass for a muddle. As pointed out by him, the wholesalers, responding to Government's invitation, have already set up a purchasing organisation in the districts and made advance payments to the growers. The sudden change in the Government's policy, therefore, will lead to loss to wholesale dealers. The stocks held by these dealers are estimated at 125,000 maunds and the Government's decision to seize these stocks at a flat rate of Rs. 14/4/- a maund has been rightly assessed by Mr. Das as a great injustice to them.

Mr. Das commented favourably on the free market rice scheme. It has already become popular with the consumers who are now getting good quality rice at reasonable prices for the first time in ten years or so. About a million card holders representing 16 per cent. of the total number of rationees are now buying rice from the free market, the weekly offtake being about 30,000 maunds. In the circumstances Mr. Das seems justified in holding that within a year or so most rationees will prefer free market rice to that now selling in the ration shops thus helping the Government in carrying out its policy of gradual decontrol. One of the reasons why the Government have decided not to allow the wholesale dealers to buy rice in the districts may be that they fear that such buying by private traders will disturb the rice position in villages. Mr. Das has tried to allay the fear by pointing out that with permission to buy the surplus rice in West Bengal and Orissa, wholesalers can safely undertake the responsibility of feeding Calcutta through free market shops and that procurement by them of 1.5 m maunds of rice per year—less than 2 per cent. of the State's total production—cannot disturb the rice position in the villages.

Mr. Das has gone so far as to warn that the Government's decision mentioned above will mean the end of the free market rice scheme. He is afraid that it will also retard the process of gradual food decontrol. It will also mean loss to the growers who cannot hope to get remunerative prices for their grain in the absence of competitive buying. Many who have been making a living from the expanding business under the freemarket rice scheme will be thrown out of employment as a result of the Government's decision not to allow wholesale dealers to buy in the districts. These are all the reasons why Mr. Das has appealed to the Government to revise decision.

RAW WOOL

As per their announcement of Sept., 12, last, the Government decided to license the export of raw wool to actual shippers upto 20 per cent. of the shipment effected by them during the first half of 1953. This evoked potest from wool exporters who said that the supply position of raw wool within the country was quite comfortable and restricted exports would lead to heavy accumulation of stocks and falling prices. The Government were, therefore urged to further liberalize their policy in regard to the export of raw wool. It is heartening to note that the Government have agreed to do as requested by deciding to grant export licences to actual shippers upto 60 per cent. of the shipment effected by them during the period January to June,

1953. The licences will be valid upto the end of February next. The shippers who might not have made any shipment during the first half of 1953, but who had exported during January to June, 1952, or January to June, 1951, will also be considered for export allotments. The trade, however, does not feel satisfied wholly. It looks askance at the procedure for granting export licences on the basis of actual shipments previously made and not on the "first come first served" principle. It has been pointed out by the trade that the quantity released for exports is large enough to permit licences being issued on the "first come first served" principle.

PENCIL INDUSTRY

The Tariff Commission has recommended that protection granted to the pencil industry be withdrawn and acting on this recommendation the Government have decided that protection would end after the expiry of this month, that is, with effect from January, 1, next.

The country's pencil industry is now enjoying a period of prosperity in point of both quality and quantity. As estimated by the Tariff Commission, the output of the industry at the end of 1953 will be no less than 8 lakh gross per year. The country's demand is estimated at 6 lakh gross per year, which may progressively increase at the rate of 10 per cent. per year. The rated capacity of the industry being much above the actual production, withdrawal of protection cannot but be hailed as a correct decision. The Commission takes the view that the quality of the indigenous pencil has improved sufficiently and so it can be expected to withstand the competition which may arise on account of the withdrawal of protection. The quality of the indigenous manufacture will improve further if the industry could secure the services of a technical expert under the Point Four Aid Programme. The Commission has recommended the establishment of the slat industry with a view to eliminating the difficulty the industry is experiencing in regard to the supply of slat. The prices of indigenous pencils are much lower in most cases than those of the imported ones on the c.i.f. basis. Obviously, therefore, the indigenous pencil industry will not find any difficulty in selling its products because of the price advantage it is enjoying. The following figures reveal the difference between the ex-works prices of indigenous pencils and the lowest c.i.f. prices of imported pencils, calculated on the per gross basis:—

	Imported c. i. f. prices.			Ex-works prices.		
	Rs.	As.	P.	Rs.	As.	P.
Black lead pencils	16	0	0	7	15	3
Coloured Pencils	13	0	0	14	14	3
Copying pencils	15	9	0	13	14	8

Apart from the above considerations relating to the industry's rated capacity, the quality of its products and their moderate prices, the present import duty on all types of pencils is as high as 66⅔ per cent. While recommending withdrawal of protection the Tariff Commission has presumed that the Government will continue the floor c.i.f. prices as well as the high rate of duty levied under the Finance Act. 1953. If the Government feels it necessary to make any change in the rate of import duty, care must be taken to examine the position of the industry before any scaling down of the rate of duty is decided upon.

We are not aware how the country's pencil industry has reacted to the Government's decision to withdraw the protection it has been enjoying. But really speaking, there should be no cause for concern if the Government pays heed to the various suggestions made by the Tariff Commission. The Commission wants the Govern-

ment to restrict the estimates that there will be no need to import pencils in 1954. Import licences, it recommends, should be made valid only for black lead pencils whose c. i. f. price is not below Rs. 16 per gross and for coloured and compying pencils whose c. i. f. price is not below Rs. 20 per gross at present. Obviously, these pencils are of a quality to the level of which the indigenous products are yet to rise. The Commission has also requested the Government to continue to encourage the industry by patronising its products as it has been doing for the past few years.

The industry should feel happy to learn that the Government has given the word that at any time the import duty needs to be reduced, it will be open to the industry to ask for further enquiry by the Tariff Commission. In regard to Commission's suggestion relating to the need for both qualitative and quantitative restriction of imports, the Government has made no definite commandment. However it has been promised that the import policy to be announced each half year will be based on the circumstances prevailing at the time of announcement and the recommendations made by the Commission will be adhered to as far as possible.

AN OIL AGREEMENT

An agreement was recently signed in Delhi between the Government of India and the Standard Vacuum Oil Company for the joint exploration for petroleum and production of petroleum, if it is discovered in commercial quantities in West Bengal. This agreement will undoubtedly be welcome to those who have been speculating for some time past on the presence of oil in certain parts of West Bengal. At present we have to depend to a very large extent on foreign countries for the supply of our requirements in oil. We have to end this dependence not only because it does not fit in well with our newly acquired status of independence but because our oil imports exert an appreciable pressure on our slender resources of foreign exchange. Apart from the paramount need to conserve foreign exchange, we have to make a cautious estimate of the present world situation which may worsen any moment thereby cutting us off from our sources of supply. The best insurance against any such future uncertainty lies in and through our efforts to tap all the resources of oil which may be available within the country and to develop our production of substitute fuels which may help us liquidate our slavish dependence on petroleum.

Under this agreement above referred to the Government will provide a quarter of the expenditure, the balance being borne by the Standard Vacuum Oil Company. There are critics who have contracted the habit of looking askance at the Government financing schemes and projects which are likely to fizzle out, little caring to count the gains that might accrue in case the project concerned does not fail through. The Government have done well in forestalling their opponents by fixing a maximum limit of the amount they will spend on the exploration for oil, which in the present case will not exceed Rs. 2½ crores. If the operation proves successful, the Standard Vacuum Oil Company will consider the the erection and operation of a refinery of a minimum capacity of at least 10,000 barrels a day. The agreement under notice here is not the only one of its kind made by the Company with the Government of India. Two years ago the Company made an agreement with the Government of India for the construction and operation of a large refinery near Bombay, it may be recalled here.

Textile Printing and Discharging

A brief survey of the methods and principles involved in the printing of vat dystuffs is set out below. Styles of printing and recipes for the application of all forms of colouring matters are constantly changing. Methods vary widely from factory to factory, whilst local conditions and the demands of fashion and sales requirements call for many modifications in procedure and style. It is therefore impossible to give accurate details of the very latest technique. For these reasons only broad outlines of the various aspects of vat-colour printing can be dealt with.

Vat dyestuffs can be applied in textile printing by means of a variety of styles, including the dyed, padded, direct printed, reserved, and discharged styles. They may also be employed in the production of coloured discharge effects upon dyed grounds of other dyestuffs, and in special cases upon vat-dyed grounds.

The high cost of vat dyestuffs restricts them to the more expensive fabrics such as are used in shirtings, certain dress materials and for light and heavy furnishings. In these cases there is always a demand for excellence in resistance to such destructive influences as light and washing, and in this respect the vat dyestuffs and their solubilised derivatives are unsurpassed. There are, of course, many vat dyestuffs which are not of "Indantherene" fastness, but it is not necessary to use these members of the group since a sufficient number of dyestuffs exhibiting highest fastness is available.

From the physical point of view, vat dyestuffs for printing must be in a very fine state of division if they are to yield prints which are free from specks. Great care is therefore needed, both in their manufacture and in their preparation for printing. The "paste fine" and "powder fine for printing" types are usually the only ones employed by the fabric printer, although various special brands such as the Suprafix brands (I.G.) are particularly suitable.

It has already been pointed out that, in the application of vat dyestuffs by dyeing methods, it is necessary to convert the insoluble colouring matter into its soluble leuco-compound by means of alkaline reduction. After absorption of the leuco-compound by the fibre, it is necessary to restore the dyestuff to its insoluble form by means of air-oxidation or chemical oxidation. This principle is adhered to in vat-colour printing, but in this case "local dyeing" is achieved by forming the dyestuff pigment into a paste by means of a thickener, and applying it locally in the presence of an alkali and a reducing agent which only exerts its influence at elevated temperatures. Reduction of the dystuff is subsequently brought about by passing the printed material through a steaming or ageing device, and the shade is finally developed by oxidation.

THICKENING AGENTS

The different styles of vat printing demand the use of various special thickening agents, and in multi-coloured work different thickeners are often employed side by side to produce the different shades. Dark and light British gums are probably the most impotant thickeners, but wheat starch, gum tragacanth and crystal gums have their specific uses. For

general work it has been shown that the highest colour value is obtained when starch thickeners are employed, but goods so printed exhibit a harsh handle in the areas of the printed design. Uneven results are often obtained with starch, especially when the design or pattern is of large size, but this may be counteracted by small additions of gum tragacanth.

Although the British gums yield rather less colour value than starch, their use is essential for all fine work and their cheapness is a great asset. Individual styles call for mixtures of printing gums, and the choice is mainly dependent upon the fabric and upon the alkali used in making up the print paste.

The reducing agent in general use is sodium sulphoxylate-formaldehyde, which is marketed under a variety of trade names, e.g. Formosul (Bro.) and Erasol (L.B.H.). During steaming, this compound decomposes, with consequent reduction of the vat dyestuff. The alkalies employed are sodium or potassium carbonate, caustic soda and caustic potash. Other compounds are often added to the print paste in order to obtain easy workability, fine dispersion of the colour particles, and brightness and clarity of the finished prints. Such compounds include glycerine, olive oil, cotton-seed oil, sodium benzylsulphanilate (Dissolving Salt (L.B.H.) and Solution Salt (I.C.I.), phenolates, naphtholates and dihydroxydiethyl sulphide (Glyecine A (I. G.).

INDIGO-DIRECT PRINTING STYLES FOR COTTON

THE GLUCOSE PROCESS.—In this process the white cotton fabric is first prepared in a padding mangle with a 25 per cent. solution of glucose and the goods dried before printing. Thickenings of dark British gum and starch are employed, together with caustic soda, in the preparation of the printing colour. Where pale shades are to be applied it is necessary to reduce the normal print paste in strength, by addition of further quantities of alkaline thickener, gum Senegal and glycerine.

Steaming is carried out in moist steam at 100°C. for ½ to 1 minute. On leaving the ager the printed portions will be brownish-orange if they are at the correct state of reduction. A yellow colour indicates over-reduction of the indigo, and trouble in the subsequent oxidation of the goods is bound to follow. Steaming should always be carried out immediately after printing, since the caustic soda in the print paste has a strong tendency to absorb carbon dioxide and thus lose its power of reacting with the glucose and the indigo. After ageing, the steamed and printed goods are oxidised by passing them through a cold solution of potassium bichromate and D. O. V. Soaping completes the process.

THE HYDROSULPHITE PROCESS. — In many factories the glucose process has now been entirely replaced by the hydrosulphite process. The former method is said to be cheaper and is still employed to some extent for the production of pure indigo styles.

In preparing print pastes of the hydrosulphite type, the alkaline thickening agent (consisting of British gum and caustic soda) is first mixed with the Formosul type of reducing agent and heated until the latter has dissolved. After this reduction paste has cooled the indigo paste and a further small quantity of alkaline thickening are added. Steaming of the printed goods is carried out with steam containing varying amounts of moisture (dependent

upon the strength of the print) at 102°-104°C. After cooling, the fabric is rinsed in copious amounts of cold running water, and then soured and soaped on the continuous range in open width.

Indigosol O. i.e. the solubilised form of indigo, has replaced ordinary indigo to a large extent on account of its greater simplicity in working. The goods are printed with a starch-tragacanth thickened solution of Indigosol O containing small quantites of soda ash and Turkey Red oil, as well as the sodium nitrite required for dired, developed in dilute sulphuric acid, oxidation. After printing, the fabric is and then finished off in a similar manner to indigosol dyeings.

DISCHARGE STYLES

There are many processes for discharging dyed or printed indigo grounds. They fall into two classes, viz. oxidation processes and reduction processes, which are briefly described below. Amongst the former the following are the most important.

(1) THE CHROMATE DISCHARGE.—In this process sodium bichromate thickened with British gum is printed on the indigo-dyed fabric, and the goods are then passed through a hot bath containing sulphuric and oxalic acids. Chromic acid is thereby liberated and exerts a strong oxidising action upon the indigo in the printed areas, the isatin dissolving out and leaving desired white design. Coloured discharge effects are obtained by including suitable mineral pigments or azoic dye components in the discharge paste.

(2) THE BROMATE DISCHARGE. — In this case the indigo-dyed cotton fabric is printed with a discharge paste consisting of sodium bromide, sodium bromate and a thickening agent. The printed goods are then treated in dilute sulphuric acid in order to liberate the bromine. The latter has a very strong oxidising action and, as in the chromate process, isatin is formed, with consequent production of a white discharge.

(3) THE CHLORATE DISCHARGE.—The dischage print paste for this purpose is composed of sodium chlorate and a small amount of an oxygen carrier in the form of a vanadium salt or a ferocyanide, together with China clay, citric acid and British gum, starch or gum Senegal.

Steaming of the printed goods takes place in the rapid ager for 1-3 minutes. Coloured discharges cannot, in general, be produced by this process, although it is possible to produce Chrome Yellow discharges and various other effects of a similar nature. Special methods, however, have now been developed which permit the simultaneous application of anthraquinonoid vat dyestuffs and Naphtol AS combinations in conjunction with chlorate discharges.

(4) THE PRUSSIATE DISCHARGE. — Medium and light shades of indigo may be discharged by printing the goods with red prussiate of potash and then treating with caustic soda. The process is often used in combination with azoic compounds of the B-naphthol class.

(5) NITRATE DISCHARGE (FREIBERGER PROCESS).—In this process, indigo-dyed goods are discharged by printing first with a thickened paste of sodium nitrate containing a little sodium nitrite. The goods are then dried and passed very rapidly through a bath of 30 per cent. sulphuric acid at 90°C., followed immediately by thorough rinsing. The liberat-

ed nitric acid, in conjunction with the sulphuric acid, totally destroys the indigo. Coloured discharges are prepared by treating the dyed fabric with a "naphtholate" and including a diazotised amino-compound in the discharge paste.

REDUCTION PROCESSES FOR DISCHARGING INDIGO.—Reducing agents of the hydrosulphite-formaldehyde class can be employed in the production of white discharges on indigo grounds. Such compounds are applied in the form of a thickened print paste. The printed goods are dried and steamed for 3-5 minutes in air-free steam at 102°C., then given an immediate passage through a hot bath of caustic alkali, and finally soured, washed and soaped. Alternatively, the steamed goods are treated in hot sodium bisulphite solution prior to the alkali bath. There are many disadvantages attached to this process. The purity of the white discharge is very dependent upon the continuity of the process, and if the alkali treatment does not follow immediately after steaming the discharge is not produced. Additions of anthra-quinone, acetin and zinc oxide are of great value in preventing such undesirable results.

Leucotrope compounds (tertiary bases with benzyl chloride) are now probably the most widely used discharging agents for indigo. They are used in conjunction with compounds of the hydrosulphite-formaldehyde type, the O brands give a bright golden-yellow dischage, whilst the W brands give a white discharge. Anthraquinonoid vat dyestuff discharges may be produced in indigo grounds with the aid of these products.

Other methods of discharging indigo by processes of reduction include the Glucose Discharge Process and the Titanium Discharge Process.

RESISTS OR RESERVES UNDER INDIGO GROUNDS.—In contrast to the white or coloured effects produced by discharging the dyed ground, the resist or reserve styles involve treatment of the fabric before dyeing. Discharging agents destroy dyestuffs, whilst resisting agents prevent the dyeing or fixation of dyes on the fabric.

Inorganic salts which possess an acidic and oxidising character, and are capable of being precipitated by the alkali of the dyebath in the form of gelatinous hydroxides, are employed for this purpose, particularly salts of copper, manganese, zinc and lead in the form of their acetates, chlorides, chromates, nitrates and sulphates. They are applied in thickeners which yield an elastic print which is resistant to mechanical damage. The function of the resist salts is to precipitate the dissolved leuco-indigo in the printed parts and so prevent dyeing in those areas. The resistance of the coating of thickener, as well as the formation of deposits of hydroxides, also inhibits dyestuff penetration. Both coloured and white resist effects can be obtained in this way, depending on the particular inorganic salts employed. If the cloth is first prepared with Naphthols and subsequently printed with resist pastes containing diazotised bases, it is possible to produce a large range of coloured effects.

INDIGOID VAT DYESTUFFS.—Derivatives of indigo, represented by the Durindone, Ciba and Helindon ranges, are applied in printing in much the same manner as indigo itself, although individual dyestuffs require modified processes. Much less alkali is required for the derivatives of indigo than for indigo itself, and the alkali carbonates usually replace the caustic alkalis in the printing pastes. The

Formosul or Rongalite C type of reducing agent is almost always employed, although a stannic oxide—caustic soda process is suitable for some members of this class. The choice of thickening agents depends upon the style of printing to be used and, in particular, upon the nature of the fabric; in general, a mixture of British gum and gum Senegal yields the best results. Fixation is effected by steaming in the rapid ager at 102°C. and then oxidising in air, and is followed by the usual cold-water rinsing and final soaping.

Indigoid vat dyestuffs are very versatile printing dyestuffs, since they may be dyed, printed, discharged and resisted with equal ease. They can also be applied alongside azoic dyestuffs, steam colours, basic colours, vegetable colours and Aniline Black in the production of multicoloured designs.

ANTHRAQUINONOID VAT DYESTUFFS. The chief method of applying this class of vat dyestuffs to vegetable fibres is provided by the Alkali Carbonate-Formosul Process. The print paste is made up as follows:—

Dyestuff paste	1-2	gallons.
British gum thickening	4½	„
Glycerine	3	pints.
Potassium carbonate	13½	lbs.
Formosul	6-12	„
Solution salt B N (I.C.I.)	0-2	„
Bulked to	8	gallons.

This print paste is reduced in strength as required by adding a quantity of the following Reduction Paste:—

Glycerine	3	pints.
Potassium carbonate	10	lbs.
Formosul	5	„
Solution salt B N (I. C. I.)	0-2	lb.
British gum thickening	7	gallons.
Bulked to	8	gallons.

The goods are printed and dried, and then steamed, either in the rapid ager for 4-7 minutes, or in the Festoon Drier for 20-25 minutes at 101°-102°C. As soon as possible after steaming, the goods are oxidised by passing them in open width a solution of bichromate. The prints are then soaped at the boil.

The alkali carbonate-formosul process is also very suitable for printing indigoid vat dyestuffs, and it is probably the most widely used method of printing vat dyestuffs, although other methods such as the pre-reduction process; the caustic alkali process and the non-ageing may also be employed.

In the Pre-Reduction Process sodium hydrosulphite is used as the preliminary reducing agent. For this purpose, 1-2 gallons dyestuff paste are incorporated with 4 gallons thickening 3 pints glycerine and 13½ lbs. sodium carbonate or potassium carbonate; 2-3 lbs. hydrosulphite are then worked well into the paste and the whole is heated in a steam-jacketed pan to 50°C. until reduction of the dyestuff is complete. The print paste is then allowed to cool down 5-10 lbs. Formosul are added and the volume is adjusted to 8 gallons.

Caustic soda may be employed in the initial reduction of the dyestuff in conjunction with hydrosulphite, but it must be converted into sodium carbonate before printing by adding sodium bicarbonate. Thus, 1-2, gallons dyestuff paste are incorporated with 1 gallon thickening and 3 pints glycerine; 2 pints 90°Tw. caustic soda and 2-3 lbs. hydrosulphite are then

added and the mixture is worked well for 10-15 minutes while heating to 60°C. The reduced vat dyestuff paste is then allowed to cool and 5-7½ lbs. sodium bicarbonate or potassium bicarbonate, as well as 3½ lbs. potassium carbonate, are added. Finally, 5-10 lbs. formosul and a further 3 gallons of thickening are added and the whole bulked to 8 gallons.

By employing the pre-reduction process the ageing time may be shortened. Further, the print pastes may be applied immediately after preparation, whereas those of the alkali carbonate-Formosul type are only suitable for use after standing for several hours. The likelihood of uneven prints, however, is increased by the use of the pre-reduction technique, on account of the formation of a scum of oxidised colour on the surface of the paste in the colour box.

THE CAUSTIC ALKALI PROCESS is now almost entirely restricted to individual dyestuffs, e.g. the Blue RS types and the browns of the anthrimide class (Browns R and G, etc.). A thickening consisting of British gum, caustic soda and Formosul is employed. The greater the proportion of caustic alkali employed in the print paste, the greater is the colour yield on the printed goods. However, too much caustic alkali results in many working difficulties, and 4 gallons 90°Tw. caustic soda per 8 gallons of print paste (containing 4 gallons British gum thickening and 8 lbs. Formosul) is about the quantity required for good working conditions. Fabrics of viscose rayon or other types of regenerated cellulose should not be printed by this process.

THE NON-AGEING PROCESS OR FERROUS SULPHATE-STANNOUS CHLORIDE PROCESS, may be adopted for a large number of anthraquinonoid vat dyestuffs; indeed it is to be recommended for such dyestuffs as Caledon Direct Black ACS (as grey), Caledon Olive RS, Caledon Red FFS and Caledon Yellow 3 GS.

The printing paste for this purpose is made up of the dyestuff, ferrous sulphate and a little stannous chloride. The printed and dried goods are then passed through warm 30°Tw. caustic soda, which reduces the dyestuff. Depending on the amount of dyestuff, from 2 to 12 lb. ferrous sulphate and up to 1 per cent. stannous chloride, based on the weight of the print paste, are employed.

The printed and dried fabric is treated in open width in the 30°Tw. caustic soda solution for ½-¾ minute at aboout 85°C., and then, after cooling, it is immersed in a second bath containing cold 14°Tw. caustic soda. After thorough rinsing to remove excess alkali, the goods are finally steeped for 1 hour in 4°Tw. sulphuric acid, rinsed again and soaped at the boil.

In order to prevent migration of the reduced dyestuff during the caustic soda treatments, additions up to 10 per cent. Glauber's salt are made. Alternatively, aqueous manganese dioxide (1-10 gallons per 10-100 gallons caustic soda solution), prepared from 1 gallon of 72°Tw. manganese chloride solution and 3½ gallons water, may be used. This solution is then stirred into 1 gallon of 52°Tw. caustic soda and 3½ gallons of 12°Tw. bleaching powder solution.

COLLORESINE PROCESS. — Colloresine DK is a methyl cellulose thickener which is insoluble in hot water and concentrated alkalis, but soluble in cold water. Prints in which methyl cellulose has been used

do not mark off during steaming or boiling after treatments. The prints may be dried after printing and stored for a considerable time without any fear of deterioration.

Colloresine DK is pasted with water at 70°C., containing a little ammonium thiocyanate. After cooling to 50°C., the solution is thickened with starch paste. A suitable paste may be made up as follows:—

Dyestuff paste	250	parts.
Water	80	„
Solution salt B	20	„
Starch thickening	350	„
Glycerine	50	„
Colloresine solution	250	„

The printed and dried fabric is padded in a cold bath prepared from 70 parts Formosul, 33 parts soda ash, 50 parts glycerine, 33 parts Glauber's salt and 310 parts of water. A rapid steaming follows, and the goods are then rinsed, first in cold water (which removes the colloresine) and then in hot water, and finally soaped at the boil. The Colloresine process is particularly suitable for screen printing.

Discharge Styles and Discharging Vat-Dyed Grounds.—The anthraquinonoid and indigoid ranges of vat dyestuffs, when applied to direct or azoic-dyed grounds by the alkali carbonate Formosul process, are suitable for obtaining coloured discharge effects. On account of their brilliance of shade and their excellent fastness properties, these dyestuffs, in particular the indigoid range, are ideal for the purpose of "illumination." With certain direct cotton dyestuffs which are difficult to destroy, it is often necessary to make additions of anthraquinone, which sides the discharging effect of the Formosul by acting as a catalyst.

In order to prevent the transference of small amounts of print paste on to the ground shades, which would result in a general dulling of the undischarged areas, it is advisable to prepare the goods prior to printing, by padding them in solutions of Resist Salt L (sodium *m*-nitrobenzene sulphonate). If the ground shade has been obtained by the use of dyestuffs which are sensitive to alkali, a pre-treatment with a solution of a weak acid, e.g. citric acid, will counteract any undesirable large change in shade. The glycerine content of the print paste is usually regarded as the deciding factor to be regulated in the event of the formation of white rings or "halos" round the vat-printed portions.

The actual discharging of vat-dyed grounds is probably one of the calico printer's most difficult problems. With only a few exceptions, chlorate of Leucotrope pastes have little effect and, consequently, special methods have to be employed. Rongalite-Leucotrope discharge processes are the only ones capable of providing any degree of success at present, and their success depends upon the method employed in the production of the vat-dyed grounds.

Goods for this purpose are probably best dyed by the continuous process, with an immersion period of not more than 20 seconds. This method of dyeing is particularly suitable for dyeing of the anthraquinoneazine blues (RS and GCD) and for the Jade Greens. However, ordinary jigger dyeings, as well as those produced by pigment dyeing methods, will, in the majority of cases, yield good discharge effects. With many vat dyestuffs, pretreatment of the goods with a solution of Leucotrope W Conc. is necessary before they are discharged; other vat dyestuffs,

however, can be discharged satisfactorily without any preliminary treatment.

Many vat dyestuffs may be discharged to a degree described as "good to very good" by the use of the following strongly alkaline white discharge paste, without any pre-treatment:—

British gum	20	parts.
Water	80-130	,,
Glyecine A	50	,,
Zinc oxide (1·1)	100	,,
Rongalite CL (or equivalent)	300	,,
Leucotrope W Conc. (or equivalent)	75-125	,,
91°Tw. caustic soda	375-275	,,

With other members, even a non-alkaline discharge paste will yield good results, but the dyestuffs concerned are smaller in number.

The paste for this purpose consists of:—

Zinc oxide (1:1)	300	parts.
British gum (1.1)	340	,,
Glycerine or glyecine A	60	,,
Rongalite C L	300	,,

The I. G. Farbenindustrie A.-G. recommend pre-padding of the dyed goods with 2 lb. Leucotrope W conc. and 3¼ oz. glycerine per gallon of water. The goods are then dried and printed with a discharge paste consisting of:—

British gum pasted with	150	parts.
Water	410	,,
64°Tw. caustic soda	240	,,
Rangalite C L	200	,,

After printing the goods are given a 5-minute passage through the Mather and Platt ager at 101°-102°C., and then treated in full-width or rope form in a boiling bath containing 3¼ oz. 76°Tw. caustic soda per gallon, in order to strip the white grounds. Finally, the goods are soaped at the boil for 30 minutes in a bath containing 1½ oz. sodium silicate per gallon of soaping liquor. The Jade Greens require a final 1°Tw. chemicking in order to clear the whites.

The caustic soda clearing treatment is advisable for all discharge work of this kind, but it is necessary to carry out numerous laboratory trials in order to discover the best conditions for discharging specific dyestuffs and dyestuff combinations. The dyestuff manufacturers are usually willing to provide practical advice in this connection.

Reserves or Resists under Vat Dyestuffs.—The methods of producing resist or reserve effects under indigoid and anthraquinone vat dystuffs are very similar to those employed for indigo. Indeed, the details followed with indigo styles can in many cases be applied to other vat dyestuffs, although special effects, e.g. the production of coloured resists under Blue RS types, are obtained by modified methods. Thus, a resist print under Paradone Blue RS can be obtained by using a paste of zinc chloride, manganese chloride and Resist Salt L. Manganese chloride alone is reported to be quite capable of resisting the fixation of the leuco-compound during dyeing. Coloured effects may be produced in various ways. If azoic combinations are used, the diazotised base or stabilised Fast Salt is added to the resist-print paste and printed on to the "naphtholated" fabric. After printing, steaming etc., the resisted fabric is dyed by the vat-dyeing process described.

An example of a white resist paste (Knecht and Fothergill) is as follows:—

China clay	75	parts.
British gum	160	"
Water	240	"
Zinc chloride	300	"
Manganese chloride	175	"
Ludigol	50	"

The Leucotropes and Reserve Salts also possess the property of resisting the fixation of vat dyestuffs, and use is made of this fact in the production of certain styles.

Apart from using azoic combinations in the production of coloured resists, it is also possible to employ solubilised vat dyestuffs of the Indigosol type and thus produce two or multicoloured prints entirely from vat dyes. Azoics, e.g. in the form of Rapidogens or Rapid Fast Colours, may be similarly applied alongside the Indigosols in the production of multi-coloured designs.

In the Copper-Lead Salt Process of applying Indigosol resists for subsequent vat dyeing, a reserve paste consisting of copper sulphate, copper acetate, lead nitrate, lead sulphate, China clay, and gum Senegal is employed. An alternative method is provided by the Ludigol-Manganese Resist Process. The heavy metal salts of Ludigol (*m*-nitrobenzene sulphonic acid) are far less soluble than the corresponding alkali salts. For this reason they strongly resist the vat dyebath. Manganese Ludigolate, basides resisting vat dyestuffs, acts as an oxidising agent for the Indigosols.

BATTIK DYEING.—This is an ancient oriental process of ornamentation originally used for the production of resisted pattern effects upon sarongs, etc., use being made of the water-repellent nature of waxes and resist in the preparation of designs. Penetration of dyestuffs into the prepared areas is thus prevented, and, after dyeing, the resist is removed either by soaping or by solvent extraction, and the undyed portions are left in the form of a white design upon a dyed ground.

There are many modern modifications of this ancient process, and the cold-dyeing vat dyestuffs play an important part in the production of durable fabrics printed in this style; B-naphthol is often employed to prevent saponification of the wax resists during dyeing.

THE SULPHURISED VAT DYESTUFFS.—Hydron Blues, Hydron Black C, and the Indo Carbon Blacks are widely used in the printing of cellulose fabrics. They are applied in a manner similar to that used for anthraquinonoid vat dyestuffs, usuig print pastes thickened with starch-tragacanth, gum Arabic or British gum, and including and alkali-metal carbonate, glucose, and a reducing agent of the sulphoxylate-formaldehyde class. The following examples will serve to illustrate the formulation of print pastes for this class of colouring matters:—

Hydron printing blue 3 R paste	150	parts.
stirred into		
Glycerine	30	"
Glyecine A	30	"
Water	150	"
Starch-tragacanth thickening	500	"
Potassium carbonate	70	"
Rongalite C (I. G.)	70	"
Hydron black C suprafix powder	120	parts.
stirred (cold) into		
Special thickener	750	"
Water	130	"
are then added		

The Special Thickener for this purpose consists of:—

Starch-tragacanth thickening stirred with	550	parts.
Glycerine	40	„
Glyecine A	40	„
Soda ash	65	„
Glucose (1:1)	200	„
Rongalite C	40	„
Water	45	„

This is heated slightly, and then are added

Depanol J (I. G.)	20	parts.

The above print pastes are allowed to stand overnight before use. The printed goods are dried and then steamed in the rapid ager for 3-5 minutes. They are then oxidised with either sodium perborate or sodium bichromate and acetic acid. Finally, the prints are rinsed and soaped at the boil.

Preparation of Honeyed Candies

The word honey has come down through the centuries as an enblem of sweetness, flavour, goodness, and health. Its very name attached to a food or candy carries an appeal to the public. It has an advertising value recognized by bakers and candy makers alike. Honey cakes honey bread, honey candies appear on the market under various trade names and the purveyors of these foods freely admit that the magic name honey alone helps to sell the product. There is nothing like a good name and in this respect honey among foods has a distinction quite unique.

DIFFICULTIES IN MAKING A HONEY CANDY

It should be frankly stated that it is not an easy matter to make a really good honey candy, using enough honey without becoming sticky on standing, especially in hot weather. As honey contains one sugar, levulose, which is hygroscopic, a candy containing honey will become sticky unless provision is made to prevent it. This very quality is invaluable in cakes, cookies and breads, because it keeps them moist. There are two ways of overcoming this in candy: first, by the use of a combination of lactose or a milk sugar, and, second, by the use of some other sugar such as corn or cane sugar, skim milk, or whole milk powder, or even commercial glucose.

There is another difficulty in the use of honey for candy making. Honey is seldom uniform in its proportions of its two principal sugar, levulose and dextrose. It varies again in its percentages, though small, of its minerals and of its colloids, of its water content and its degree of inversion. In general its low caramalization point must be taken into consideration.

TWO SCHOOLS OF CANDY MAKERS

There are two schools of candy makers. The one believes it is not possible to make a good tasty honey candy without using milk sugar (lactose), milk

powder, cane or corn sugar. The claim is made that a pure honey candy is too sweet and wil soon cloy the appetite, that for reasons already explained it will as soon as warm or hot weather comes on, become sticky; that the coating of chocolate or wax will ultimately crack, allowing the honey within to ooze out with the result that the whole box will become sticky.

The other school of honey candy makers insists that a candy bearing the name honey should contain no other major sweet than honey.

Corn sugar is only about half as sweet as honey. It helps to correct the over sweetness of the pure honey and at the same time increases the dextrose content of the candy so that the relative amount of levulose that causes stickiness is reduced.

EQUIPMENT NECESSARY

The following equipments are generally required in candy making:—

1. Thermometer:—This is essential in order to obtain uniformly good results in candy making.
2. Saucepans:—Choose a saucepan of the proper size for the kind of candy to be made. Remember that all candy boils up and space must be allowed for this. The saucepan should have a smooth surface, because any rough spot cause the candy to stick and burn. Copper, aluminium, agate or tin may be used.
3. Spoons and Spatulas.—Wooden spoons are desirable for candy making, because they do not become too hot to handle when left in the cooking. It is also easier to beat with a wooden spoon, because the handle does not cut into the hand.
4. Measuring cups:—It is better to use a standard measuring cup than a tea cup.
5. Professional Equipment: — A slab with metal candy bars is useful. By means of the bars you can regulate the size of your block of candy When the candy is firm the bars can be removed.

TYPICAL RECIPES

Most of the recipes here given call for some other sugar in varying proportions with honey. The purpose of this has already been explained. Any recipe that will use at least some honey helps to make an outlet for the beekeepers' product.

There are some recipes that call for twice as much of some other sugars as of honey. A satisfactory nougat, for example cannot be made without an excess of cane sugar. Again in other recipes, a brown sugar will do what neither a honey nor granulated sugar will accomplish. Each of the sugars has their own special uses. It would be folly and only end in failure to make honey, an invert sugar, perform the function of a sucrose. Hence there will be a variation in the proportions in the different sugars.

HONEY FUDGE

Honey	¼ cup.
Sugar	2 cups.
Evaporated milk	1 cup.
Salt	¼ teaspoon.
Nuts	1 cup.
Chocolate (cut fine)	1 square,

Boil sugar, chocolate, salt and milk for **5 minutes. Add** honey and cook to the **soft ball** stage (235°F). Add butter. Let **stand** until lukewarm. Beat until creamy. **Add** nuts, pour on buttered pan, and when **hard** cut in squares.

HONEYED FRUIT STRIPS

Remove *peel from 3 orange and cut in* **strips.** *Cover with water to which 1* **teaspoon** *of salt has* **been** *added. Boil 30* **minutes** *and drain. Cover with fresh water and boil until the peel is tender. Drain,* pour enough honey over the peel to cover, usually from ¾ to one cup. Let simmer very slowly until fruit peel is clear about 45 minutes. Lay on waxed paper and let stand two or three days before using.

HONEY FRUIT SLICES

Honey	3 to 4	tablespoons.
Coconut shredded	½	cup.
Dates stoned	½	lb.
Chocolate	½	square.
All-bran	2	cups.
Raisins, seedless	½	cup.

Run coconut, raisins, and dates alternately through the food chopper. Add melted chocolate, bran and honey alternately. Form mixture into a roll. Cut in slices with sharp knife. Wrap in waxed paper and store in a tightly covered container.

HONEY FRUIT BALLS

Toast a cup of shreded coconut in a moderate oven 350°F until a delicate brown. Wash a cup of dried apricots and a cup of dried peaches and steam for five minutes. Put fruits through the medium fine knife of the food chopper while they are hot; add a tablespoon of honey and the toasted coconut. Blend thoroughly. Shape into small balls or into a round loaf and slice when chilled. **Reserve some of the** toasted coconut **in which to roll the balls.**

CARAMELS

I

Honey	1	pint.
Cinnamon or vanilla	1	teaspoonful
Cocoa	½	lb.
Peanut	¾	lb.
Sweet almonds	2	lbs.

Cut the nuts fine, and boil them with other ingredients until thick. Cool and roll out. Cut in square and dry in the oven.

II

Honey	1	cup.
Sugar granulate	1	cup.
Sweet cream or milk	3	tablespoonfuls.

Boil to a "soft crack," or until it hardens when dropped into cold water, but not too brittle—just so it will form into a soft ball when taken in the fingers. Pour into a greased dish, stirring in a teaspoonful extract of vanilla before taking off. Let it be ½ or ¾ inch deep in the dish: and as it cools cut in squares and wrap each square in paraffin paper. To make chocolate caramels add one tablespoonful of melted chocolate, just before taking off the stove stirring it in well.

FRUIT CANDY

Butter	1	cup.
Honey	2	cups.
Sugar	2	cups.
Boiling water	1	cup.
Cream of tartar	¼	teaspoonful
Glycerine	½	"
Soda bicarb	1	pinch.

Boil all the ingredients together for 10 minutes to a soft ball, and set in a cool place. When it has cooled slightly, stir in 1 or 2 tablespoonfuls of peanut butter; keep stirring till creamy; then pour into buttered pans; mark in squars.

FRENCH CANDIES

In an enamelled saucepan melt 1 part of gelatine in 1 part of water, stirring well. When at the state of a soft paste, add 4 parts of honey previously warmed, stirring vigorously. Take from the fire; add the desired flavour and colour, mixing carefully, and pour into a shallow lightly greased dish. Let it dry for few days before use.

TOFFEE

Sugar	4 oz.
Honey	2 ,,
Butter	2 ,,

Melt the honey and sugar together in a pan and cook slowly for 15 minutes, then add the butter, and cook for another 5 minutes. Try in a cup of cold water about 10 drops of toffee, and if it sets, it is done; turn into a lightly buttered tin pie plate scatter nuts over top and let set. Break into small pieces by hitting plate on the bottom.

HONEY CHOCOLATES

Sugar	5 lbs.
Honey	2½ ,,
Water	1½ pints.

Cook to 240°F. Pour on a dampened slab. When lukewarm pour in the batch 2 lbs. of ground peanuts (peacans), then cream it in the usual way. Melt the cream, adding ½ pint glass of simple syrup. Run into the shape of patties. Dip in sweet chocolate.

GOOD CANDY

Sugar	2½ cups.
Honey	½ cup.
Water	½ ,,

Boil until thick syrup. Pour 1 cup of this syrup on the beaten whites of 2 eggs, stirring meanwhile. Boil remainder of syrup till it hardens when dropped in water, then pour it into the syrup and eggs, stirring briskly. Add a cupful of peanuts. Stir until it begins to harden; then spread in a pan and cut in squares. Flavour to taste. If properly made it will be soft and pliable.

HONEY STUFFED DATES

Remove stones without marring the shape of dates. Fill the cavity with a tiny piece of comb honey and then dip dates as ordinarily when coating candy. After a week or two the dates seem to absorb most of the honey, and when one bits into candy a most flavoured date centre is found. This candy should be aged at least two weeks before packing.

HONEY CRISP

Shelled walnut meat	1 cupful.
Honey	2 cupfuls.

Break or chop the nuts into small pieces and spread them in a medium-sized dripping pan which has been well oiled with butter or salad oil. Put the honey into a saucepan, place it over a gentle heat and let boil for 5 minutes after it reaches boiling point, stirring occasionally while cooking. Pour over the nuts, set aside to become hard, then crack the crisp into convenient sized pieces for serving.

Sandblasting Practice

The sandblast process is not new as many suppose as the practice of abrasing materials with an air or steam blast of sand has been in use for at least 50 years. It is said that observation of the action of beach sand when violently blown on glass windows by storms gave the suggestion for the method. The first attempts at sandblasting consisted of imparting various intricate designs on glass. The material was covered with a stencil so that the sand acted only on exposed portions.

Latter day sandblasting is used in foundries for cleaning castings, in heat treating rooms for cleaning parts as they come from the quenching baths, for removing paint from metallic surfaces and for cleaning buildings. Various materials are used, such as silica sand flint quartz, a special material termed flint shot and chilled-iron metallic abrasives. The material to us depends on the nature of the work and experimentation only can serve as the best guide. In general it can be stated that ordinary sand is too soft. Quartz sand is harder, flint shot possesses many valuable characteristics and the metallic abrasives also are used extensively.

Various types of sandblast equipment are in use. The earliest form consisted of a sandblast chamber which was simply a room closed from the rest of the shop and equipped with a sand hose. Present-day sandblast rooms are equipped with efficient exhaust systems so that the air is changed constantly. Some are fitted with travelling conveyances that carry the materials to be cleaned through the room from side to side and in other cases with revolving tables or grantings that carry the castings slowly around in a circle. Thus the operator can perform his part by standing in one position. For cleaning large castings, an overhead trolley is provided for conveying purposes. Trucks and truck racks also are used and in some instances elevated platforms are provided on which the operator places the work. In cases where the operator must work in a sandblast chamber, he should wear a helmet equipped with an air line to provide him with pure air.

The revolving table outfit is a modification of the sandblast room. It is used chiefly for cleaning large castings that cannot be handled readily by other means. The castings are located on a revolving table which is from six to twelve feet in diameter. The rear half of the table is covered by a chamber fitted with sandblast nozzles. This chamber is separated from the outer room by slitted leather curtains. The castings pass under or through these curtains readily. As they enter the chamber they are sandblasted automatically and on emerging again they are turned in position by the operator so that on the second trip through the cabinet surfaces are reached that were not hit by the blast on the first journey. The process of turning the castings is repeated several times until the entire surface one has been cleaned effectually. The waste sand and dust is carried down into a lower chamber then upward into a separator, the clean sand being returned for re-use.

The sandblast cabinet is a refinement of the sandblast room or chamber. These cabinets are constructed in a variety of

ways and shapes, ranging from square wood boxes to cylindrical tank-linke structures. In each case, however, the operation is the same, that of permitting the operator to have both hands inside the cabinet while he views the work from the outside through a glass window or a screened opening. In some cases the nozzle is stationary, the operator moving the piece under the sandblast. other instances the sand nozzle is flexible so that the blast can be directed by the operator at will. Sandblast cabinets are used mainly for comparatively delicate work that is small enough to be handled readily. Automatic conveyors can be used to advantage in carrying the work through the cabinet.

Sandblast barrels are a modification of the old-time tumbling mill or rattler. The sandblast barrel revolves slowly so that the sandblast jet does the work instead of the erosion of the parts against each other. A sandblast barrel will do ten times the amount of work in a given time than can be cleaned in a rattler. Again, due to the slow speed of the barrel, delicate castings can be handled which would be broken by the rough usage in an ordinary tumbling barrel.

The open sandblast is used for a diversity of purposes, such as cleaning stone and brick buildings, cleaning castings, etc. The work is done in the open with the hose and nozzle connected with an air compressor and a sand supply. Sometimes sand is fed by gravity into a column of air under pressure. In other instances the sand and air are mixed under pressure. The tank can be portable or stationary. The sand gun is an appliance consisting of a hose and nozzle. One end of the hose sucks up the sand from a tank or hole while the other end is connected with the nozzle that is directed against the work.

A certain amount of waste accumulates in any sandblasting operation. as the process always creates a fine dust, while also the abrasive wear creates waste material. Means therefore are applied for retaining and separating the waste from the abrasive material so that it can be used over again. Two methods are employed: centrifugal separation and bolting. The former method is the simpler. In the bolting method wire screens or bolting cloth are used. The bolting element can be a long tube in which the descending dust is met with an ascending column of air. The heavier particles fall to the bottom and the finer are blown out at the top into a receiver.

After separation, means must be provided for carrying away the dust without blowing it all over the premises. Such devices consist of overhead hoppers with tubular fabric spouts to convey the dust into closed receptacles. Another solution of the problem is found by moistening the dust with a water spray or steam jet which coagulates and precipitates it. The latter method has been used with excellent results.

A novel use for the sandblast process is the cutting of letters and designs on monuments. The process is comparatively simple and is said to be superior to lettering by hand or with the aid of air chisels. The accompanying process which were supplied by the Pangborn Corp., relates how the sandblast process is used in monumental yards. First the operator unrolls enough of a specially prepared stencil to cover the "die" as the stone face is called. The stencil, must be wide enough to project about an inch all around the die. Then the stencil is wet with sponge and hot water until the composition on the stencil face is moistened sufficiently to cause it to adhere to the die face. Next

the moistened side of the stencil is placed over the die and rolled in place with a hand rolled provided for this purpose.

Considerable skill is required in the next step, which consists of laying out the design. Then the outline of the inscription is cut with a sharp knife. The stencil is tripped away exposing the portions to be acted upon by the sandblast. For making raised letters the background is stripped off. When sunken letters are wanted the letters are stripped away. The stone is ready to convey to the sandblast room. The operator blasts the stone from the outside, looking in through a window to observe the process. The abrasive action set up can be judged from the fact that a nozzle lasts from two to three hours only when the blast is on continuously.

Both sand and metallic abrasives are used for sandblasting monuments. The sand is a dry, white silica product which has sharp cutting qualities. This material can be used many times, but it loses about 15 per cent. of its volume in dust each time. Metallic abrasives cut very fast, require a minimum storage space and raise a small amount of dust only. In some instances sand and metallic abrasives are mixed; the theory being that the metallic abrasives cut fast and give a smooth surface, while the sand brings up a pleasing relief. One prominent user recommends 25 per cent. metallic abrasive and 75 per cent. sand.

Etching of Copper

All etching reagents which are used for copper have an oxidizing action.

OXIDIZING ACIDS

(a) Concentrated nitric acid occasionally gives a useful etch, but the time of etching is extremely short and, therefore, difficult to control.

(b) Dilute nitric acid (1 part acid + 1 part water) attacks the copper very uniformly, but indistinct contrasts are obtained. (Etching time, 15-30 seconds).

Nitric acid has no advantages over other etchants for copper and, therefore, is seldom used. Solution (b) can, however, be recommended for preparing the specimen by Pulsier's method of repeated polishing.

CHROMIC ACID

(a) Saturated solution. Time of etching 1-1½ minutes. Attacks the grain-boundaries and oxide globules particularly. Seems to be suitable for etching cold-worked copper.

(b) A 10-15 per cent. solution, with the addition of 1-3 drops of HCl per 50 c. c. of solution is stated by Vilella (2) to be a satisfactory reagent. Gives a pronounced grain contrast etching. Alternate polishing and etching can be used with advantage.

SULPHURIC ACID

(a) Sulphuric acid and hydrogen peroxide.

Sulphuric acid, conc.	1	part.
Hydrogen peroxide (3 per cent.)	20	parts.

Eetching time, 1-1½ minutes.

(b) Sulphuric acid and potassium bichromate.

Sulphuric acid, conc.	1	part.
Potassium bichromate (sat., solution)	10	parts.

Etching time, 30-60 seconds. Very suitable for cast copper, but attacks oxide inclusions strongly.

(c) Sulphuric acid and potassium permanganate.

Sulphuric acid, conc.	1	part.
Potassium permanganate (0.4 % solution)	10	parts.

Etching time, 1-1½ minutes. Good general reagent for copper.

HYDROCHLORIC ACID

(a) Hydrochloric acid and ferric chloride in aqueous solution.

Hydrochloric acid, conc.	30	c. c.
Ferric chloride	10	grams.
Water	120	c. c.

Etching time, 30 seconds.

(b) Hydrochloric acid and ferric chloride in alcoholic solution.

Hydrochloric acid, conc.	30	c. c.
Ferric chloride	10	grams.
Water	120	c. c.

Etching time, 30 seconds.

(c) Hydrochloric acid and ferric chloride in alcoholic solution.

Hydrochloric acid, conc.	30	c. c.
Ferric chloride	10	grams.
Ethyl alcohol	120	c. c.

Etching time, 30 seconds.

(a) and (b) both give good grain-contrast etching for low magnification. For the higher powers, the surface is roughenend too much. The alcoholic solution gives better contrasts than the other.

AMMONIA AIDED BY THE OXIDIZING ACTION OF THE ATMOSPHERE

The surface of the specimen is swabbed with cotton wool moistened with strong ammonia. The etching reagent is spread as evenly as possible over the surface, and any dark coloured patches which appear are removed by careful rubbing, so that a clear surface is obtained. When the etching process is to be stopped a few drops of water are added to the wad of wool, without ceasing the swabbing, and then more and more water is successively added until all the ammonia has been washed away. The use of excess of ammonia delays the attack because oxidation is hindered. If too little is employed a layer of cellulose is deposited on the surface of the specimen, and it has to be removed with fresh ammonia. As a result of the above treatment the attack is mainly confined to the boundaries of the grains while, generally, their surfaces remain smooth.

Guertler (2) reports that ammonia may sometimes be used in the polishing of copper specimens.

AMMONIA AND HYDROGEN PEROXIDE

(a) Equal parts of strong ammonia, and 3 per cent. hydrogen peroxide. Etching time, 5-15 seconds. Gives principally a grain-boundary etch which is very suitable for investigations at high magnifications. Ammonia and hydrogen peroxide is one of the most commonly used etching reagents for copper. By varying the proportions of the ammonia and the

peroxide the etching effect can also be changed to some extent. If the amount of peroxide is increased a grain-contrast etching is obtained. The A. S. S. T. Handbook *recommends, for cold-worked material, a subsequent etch for a few seconds with the solution (a) described under hydrochloric acid.*

(*b*) *Grain-contrast etching* is obtained with:—

Ammonia, conc.	1	part.
Hydrogen peroxide (3 per cent.)	20	parts.

(c) For cast copper, swabbing with the following solution is recommended in the A. S. S. T. Handbook:—

Ammonia, conc.	40	c. c.
Hydrogen peroxide (3 per cent.)	10	c. c.

This solution can also be used for "polish attack."

Ammonia and Potassium Permanganate.

Ammonia	2	parts.
Potassium permanganate (0.4% solution)	3	parts.

Etching time, 2-3 minutes. The solution etches best when it begins to acquire a brownish colour owing to the formation of manganese dioxide. Under other conditions a film easily forms on the surface of the specimen and masks the etching.

Ammonia and Weak Oxidizing Agents. (a) Ammonia and ammonium oxalate.

Ammonia, conc.	1	part.
Ammonium oxalate (sat. solution)	3	parts.

(b) Ammonia and potassium arsenate.

Ammonia, conc.	1	part.
Potassium arsenate (sat. solution)	3	parts.

Both these reagents act very slowly. Time of etching, about 24 hours. Solution (b) attacks copper oxide gloubles strongly.

Ammoniacal Copper-ammonium Chloride Solution.

Copper-ammonium chloride	5	grams.
Water	120	c. c.

Strong ammonia is added till the precipitate first formed is redissolved. Etching time, 30-60 seconds.

This is one of the best, and most commonly used, general reagents for copper, giving chiefly grain-contrast etching. The alcoholic solution gives poor results.

Ammonium Persulphate. A 10 per cent. solution ammonium persulphate in water is an excellent etching medium for copper, and is often employed. Better results can sometimes be obtained if a few drops of ammonia are added immediately before etching. A pronounced relief-effect is obtained, depending on the crystallographic orientation of the grains.

Bromine Water. A saturated solution of bromine in water often gives a good etch in 30-60 seconds. The coating which forms on the surface of the specimen is washed off in strong ammonia.

Silver Nitrate. (a) 2 per cent. solution of silver nitrate. Etching time, 20-30 seconds. The silver layer precipitated on the specimen is rubbed off under water. Oxide globules are strongly attacked.

(b) In Holman's method a small particle of dry silver nitrate is laid on the

specimen and a single drop of water added. As a result there is formed a light spongy layer of silver which changes colour to grey in about 3 seconds. The surface is then immediately flushed clean with water from a wash-bottle. With correct technique a good etch is obtained. The method seems to be valuable in those cases where other reagents produce undesirable etch-pits.

Electrolytic Etching. The electrolytic etching of copper can be carried out in, for example, a 10 per cent. solution of ammonium sulphate. Current density about 0.003 amp/cm². As a rule, however, electrolytic etching gives a roughened surface which is, therefore, not suitable for observation at high magnifications. Any residual grinding scratches are strongly attacked.

Recent Developments in Textile Finishes

In this survey the contributor deals specifically with the production of embossed finishes and methods of making fabrics water-repellent

by "Textile Chemist"

During the second world war many new ideas and novel methods for the finishing of textile materials were evolved, most of which had to remain dormant owing to the circumstances of the time. Even when the war finished, a period of shortages—both of machinery and operatives—caused further delay and, it is only in the past year or two that it has become increasingly possible to develop new textile processes. Yet, the recent British Industries Fair showed conclusively how great has been the progress made in textile dyeing and finishing in this time.

EMBOSSED AND SEERSUCKER EFFECTS

At one time a fabric or garment depended largely for its attractiveness on its colouring, its handle and, perhaps, on its lustre. To-day, however, surface and texture characteristics play a much more important part and there is no doubt of the popularity, not only in Britain but on the Continent and in America, of fabrics with wrinkled or puckered surfaces, i.e. with embossed and seersucker effects. Fabrics with seersucker effects can be, and of course are, produced during weaving by temporarily slackening certain warp threads at about the time of the beat-up, a method which gives a very stable fabric which maintains its puckered character even after repeated and severe washing. On the other hand, the puckered and uneven fabric surface produced by embossing offers the advantage that the style can be varried to give a wide range of effects with the same type of fabric, thus making it easier for the finisher to meet changing demands on the part of the public. The embossed finishes, however, have in general the disadvantage that they

are somewhat less stable and, although they will retain their original character *through many washes, it is possible that a drastic treatment may cause the finish to be lost or obscured.*

Finishes of this type can be produced in two ways, either by the straight embossing of a fabric made with thermoplastic yarns such as those of acetate rayon, nylon and other synthetic fibres or, in the case of a cotton or rayon fabric, by preceding the embossing by the application of a synthetic resin.

The basic principle of producing a puckered appearance on fabrics has long been known but it has taken many years to evolve really satisfactory processes. Earlier methods whereby the puckering was produced by a pattern treatment of the cotton fabric with caustic soda of mercerizing strength so as to produce irregular shrinkage of the threads, or methods whereby the cotton, linen, or other fabric was simply embossed under conditions of high temperature and pressure, had certain obvious disadvantages. The first method for example, was tedious and involved the use of dyes fast to caustic alkalis; the second method had the disadvantage that it produced results not fast to washing.

ADVANTAGES OF THERMOPLASTICITY

It is much easier to emboss a fabric made of threads which are naturally thermoplastic or a fabric which, though made of non-thermoplastic threads, has been impregnated with a thermoplastic resin. Obviously, however, success in these directions has had to await the discovery and production of such synthetic fibres as nylon, "Terylene," "Vinyon," etc., and/or the devising of satisfactory methods for the application of synthetic resins to the non-thermoplastic fibres. It *is well that a clear distinction should be* drawn between *the embossing of fabrics composed of thermoplastic fibres and those given a temporary thermoplastic character* by impregnation with a resin. The latter method offers much more scope in finishing and there are not as many limitations as are experienced in the embossing of synthetic fibre materials.

In the production of puckered cotton fabrics, the normal course of processing is to dye or print the fabric and then to impregnate it with a resin, such as an urea-formaldehyde or a melamine-formaldehyde resin, in a low state of condensation so that it is water-soluble but capable of being further condensed by high temperature heating in the presence of a suitable catalyst. The fabric is the embossed at a temperature which though high is not sufficiently high to insolubilize the resin, after which it is subsequently cured at a higher temperature which completely insolubilizes the resin and gives the embossed effects. Finally, the fabric is given a light wash to free it from loosely adhering resin.

CHARACTERISTIC RETAINED

Under the above conditions of treatment, the cotton fibres retain their original characteristics and particularly their strength. Moreover, if the resin were to be removed, the cotton fabric would be obtained in substantially the same state as it was before treatment. Thus the finishing of such a fabric cannot impair it permanently. the changes produced being simply those due to the presence of the added resin. It is obvious therefore that there can always be adequate control over fabric embossed by this method and that

special requirements of strength, handle, texture, etc., can be met by starting with a type of fabric woven for the purpose in view.

In producing an embossed nylon or similar fabric, direct advantage can be taken of the thermo-plasticity of the fibres. This, however, can introduce a complication, for in heating a synthetic fibre to a temperature at which it will satisfactorily respond to deformation under the combined influence of heat and pressure, it is possible also to produce changes in its internal structure which may not necessarily be desirable. For example, a synthetic fibre is usually produced under conditions where, at a convenient stage, it is highly stretched. Thus there is always a latent tendency for the fibre to return to its unstretched form, a tendency favoured by heating to a high temperature as in embossing. Again, the high temperature heating of syathetic fibres also creates a tendency to further polymerization. As, however, polymerization is carried to the optimum stage in the manufacture of the fibres, it is evident that any further change such as may be induced in the embossing process could lead to a depreciation rather to an improvement, of the material.

It should not be inferred from the above remarks that it is impossible to produce satisfactory embossed finishes with synthetic fibre materials. This, of course, is not the case and many such finishes are now actually being produced. It is the writer's intention merely to indicate that there are peculiar factors which have to be taken into consideration. Finally, it should be pointed out that the process of embossing is one which commends itself favourably to the textile finisher because of its mechanical nature. Naturally, a finisher always welcomes a process where a fabric enters a machine at one side and comes out treated at the other. Such a process can usually be carried out at a high rate and with a minimum of attention.

ACHIEVING WATER-REPELLENCY

Exhibits at the B.I.F. certainly drew attention to the progress made in recent years in providing fabrics and graments with a satisfactory degree of water-repellency without at the same time detracting from their suppleness, softness, and draping properties. There is, of course, still a demand for fabrics which will remain impervious to water under the most drastic conditions and which to this end are finished with a continuous natural or synthetic rubber filmforming substance. But to-day, there seems to be a much wider and more varied demand for fabrics which are showerproof, rather than waterproof, and which must also be permeable to air. Many of these showerproof or water-repellent fabrics, exhibited in the form of outerwear and raincoats, could, in fact, scarcely be distinguished by texture from similar fabrics not so finished. Gone, indeed, are the days when a showerproof finish necessarily implied a stiff handle.

In the production of showerproof fabrics there have been two distinct lines of progress. The first has involved the weaving of a special type of fabric—a ventile fabric—where the fibres and threads are so distributed that, by an initial wet lateral swelling, they rapidly fill-up the interstices and thus make the fabric resisttant to water penetration. The second has involved the application of insoluble substances which so charge the water-absorptive properties of the fabric that drops of water roll-off the surface rather than sink into it.

VENTILE FABRICS

Ventile fabrics have to conform to a preferred type of weaving construction which has been established by the British Cotton Industry Research Association, for it is necessary that the construction should be such as to allow the free swelling of the fibres with subsequent lateral displacement to fill all the fabric interstices uniformly. Subject to this consideration, it is possible to produce many types of fabric which have found wide use for sports garments, in that they allow of the outward movement of perspiration or moisture-laden vapour without the condensation common with rubberized fabrics.

The well-known and much used nethod of making fabric showerproof by epositing in or on it an insoluble uminium soap is very useful, formerly o-stage processes were in use but to-day is more convenient to employ a one-stage ocess in which the textile material has ed into it an aqueous emulsion contain- wax and aluminium acetate or formate. ese emulsions break-down unless mained in an acid state—say, at a pH value bout 5. It is worth nothing that the verproofing effect is improved by car- out the drying at as high a temure as is practicable, and certainly not 100°C. Quite recently it has been sted that the aluminium salt may be ed by zirconium[1] or titanium salts, a containing zirconium oxychloride raffin wax being very efficient.

the showerporoof finishes obtained use of waxes and platinium salts moderately fast to washing and ly easily destroyed dry cleaning, be readily understood why there e a search for methods of conferr- er-repellent finishes of greater ncy.

DEVELOPMENT OF VELAN PF

The discovery some years ago that water-repellent finishes could be obtained by impregnating cotton fabric with aqueous solutions of quarternary ammonium compounds such as octadecyloxy methyl pyridinium chloride indicated a new line of progress in using organic substances capable of chemically combining with the textile fibre and therefore resisting removal by washing and dry cleaning. During the heating of a fabric impregnated with this compound the pyridinum salt decomposes and the chloralkyl ether combines with the cellulose. A development of this process resulted in the production of Velan PF (I.C.I.) which is probably stearamidomethyl pyridinium chloride, produced by the reaction of stearamide, pyridine hydrochloride, pyridine and paraform.

Another water-repellent developed in Germany towards the end of the last war was the substance known as Persistol VS, which is also capable of combining chemically with cellulose fibres to give a high degree of water repellency fast to washing and dry cleaning. Persistol VS is available as an aqueous disperson of octadecyl ethylene urea, produced by the reaction of ethylene imine with octadecyl isocyanate.

USE OF ORGANO-SILICON COMPOUNDS

An American development in the production of water-repellent finishes is that of using organo-silicon compounds. Their present use is based on an early discovery by Patnode that methylchlorosilanes, and particularly the dimethyldichloro compound, are highly reactive towards water and that, provided suitable conditions are arranged, these silances can

be applied to textile materials containing a small amount of moisture. This involves a change into silanols and then into high molecular insoluble siloxanes and silicones, producing a highly tough and tenaciously held deposit or film which is water-repellent and resistant to washing and dry cleaning.

At first the treatment involved the application of the dimethyldichlorosilane in vapour form or as a solution in an organic solvent. Recently, however, treatment has been much simplified by the use of stabilized aqueous dispersions. Decetex 104 (Dow Corning Corporation, U. S. A. and Silicon Organic Development Limited, Britain) is a 65 per cent. solution of a silicone polymer derived from a mixture of methyl and methylhydrogen polysillsoxanes in an organic solvent (methylene chloride) which can be converted into an aqueous emulsion of the oil-in-water type suitable for direct application to textile materials and especially those made from synthetic fibres such as nylon. "Orlon" and "Terylene." The water-repellent finish is completed by a final heat treatment in which the impregnated fabric is cured at 150°C. for a few minutes.

It is quite possible that this type of water-repellent finish may be dependent not only on the deposition of stable high molecular silicones upon the surface of each fibre but also on a degree of chemical combination of the silicone with the fibre substance. In this connection, the hydroxyl groups normally present in cellulose fibres would play an important part.

The application of organo-silicon compounds to textile materials is only at an early stage of development and it is easy to foresee that there are many possibilities. Already it has been discovered how to make linear polymers from organo-silicon substances, and this indicates that in the near future it may be possible to make synthetic fibres from them. For the present, the main interest lies in textile finishing.

—TEXTILE RECORDER

Raw Materials for Paper

Many printers apparently bought paper daringly, fearing to be caught short. Some of them may now be looking rather ruefully at their paper stocks. Were they too dearly bought?

The precise meaning of papermaking may be taking on a new interest. Someone asks me what precisely does "wood free" mean. Technically, "woodfree" means a paper that has not less than 70 per cent. of sulphite or sulphate pulp or 70 per cent. of a mixture and not more than 15 per cent. of mechanical pulp fibre.

Printers, and newspaper and other periodical publication owners, are increasingly concerned as to whether the sugar cane fibre, bagasse, is likely to be of great so-called help in newsprint paper, i.e. paper production such as they need. I must not pretend to very deep knowledge on this matter, but one or two mentions I may make. A £5,000,000 plant is being set up

in Florida, U. S. A., "to make newsprint from the waste material from the sugar industry." The United Bagasse Cellulose Corporation with offices in Clewiston, Florida, was recently formed to carry out this project. The initial capacity is estimated at 45,000 tons of newsprint annually. Another item is that the Board of Trade has now told us in an economic report on Peru that one of its principal sugar producing companies claims that it has now perfected a process for making paper from bagasse without admixture of other raw materials.

STRAWS' POTENTIAL

Straw may be more used for paper. Someone was lately telling us that straw was or had been not long ago purchasable in Britain at a very few shillings a ton. That may have been true of miscellaneous pea, bean or other very mixed and very poor stuff, unsuitable for most purposes for which straw is required. I noted some weeks ago that a Colchester farmer and large supplier of straw to the paper making industry, Mr. E. L. Anning, of Colchester, had been paving farmers 32s. to 42s. per ton for straw for paper making. Naturally, straw prices are affected by weather. Few farmers have the right kind of barns empty and available for storage purposes or for what is called sheeting to ensure the straw being kept dry.

Mr. William Harrison, of Thomas Owens, the paper suppliers of Cardiff is one who has been using straw pulp producing plant vigorously and, latterly, as I understand, very profitably — "making good" some losses of previous years. His firm tell us that considerable wood pulp is of necessity mixed with the strap pulp.

Another word here on newsprint may be about the calendering, the pressing and polishing of newsprnit. This seems to be receiving a good deal of attention from the Pulp and Paper Research Institute of Canada. The calendering markedly decreses the bulk.

WHAT OF THE FUTURE

Above this Bagasse and related interests is the disturbing doubt as to furture supplies of any sort of paper. So immense are the inroads upon the spruce forests of Canada and northern Europe made by the paperproducer's axe and by forest fires and doubtless also in some degree by arboreal disease—though guarded against as never before. Great, too, is the world's unwisdom manifest in to-day's absorption of vast wood pulp in the continuance of enormous American journals, particularly mammoth Sunday papers, while British papers can scarcely report the most serious debates in Parliament so short is their supply.

Need newsprint paper ever have been quite so dear as it became? It seems to be cheapening a little. Shall we some day see a penitential procession of paper makers each man draped in white newsprint, and carrying a candle, and bowing low at newspaper offices.

—CAXTON MAGAZINE.

Manufacture of Papain from Papaya

Papain is extracted from green papaya fruits at full grown stage by lancing them longitudinally. The wet latex that exudes is collected and dried.

Owing to the lack of information on yields of papain in relation to methods of tapping, an experiment was conducted statistically to ascertain the optimum coditions under which maximum yields of papain could be obtained.

DESIGN OF EXPERIMENT

An extent of flat land at the Experiment Station, Peradeniya, equal to one acre, suitable for growing papaya, was planted with Botanist's selection C. P. 124 with spacings 10 feet by 10 feet, giving a total number of about 400 trees. The area was divided into 6 blocks with 4 randomized plots per block consisting of 3 trees per plot. A guard row of trees was left round the area. A total of 72 trees with typical female characteristics were selected for the tapping trials. Bi-weekly tappings were compared with weekly tappings and three lancings were compared with 8 lancings.

The green fruits in the full grown stage were tapped regularly in the early hours of the morning, from about 6 a.m. to 10 a.m. The latex was collected in weighed utensils and dried and weighed The tapping was continued for 8 weeks

The experiment showed that yields for bi-weekly tappings are significantly greater than yields for weekly tappings. Also 8 lanchings give significantly greater yields than 3 lancings.

Interaction is not significant.

CONCLUSIONS

According to the results obtained from 8 weeks' tappings it is evident that bi-weekly tappings would give proportionately greater yields and therefore can be recommended as a satisfactory practice.

Although 8 lanchings have given significant increases in yields, the proportioate increases are not substantial enough to justily the extra time and labour involved in administering the 8 lancings to a fruit. Moreover, as a green fruit can be tapped over a period of 3 weeks or more, it would be advisable to apply only a few incisions at a time so that sufficient space is available on the fruit to continue the lancings over a longer period, until the fruit becomes ripe and ceases to give latex. Hence three lancings with bi-weekly tappings would be the most economical to practise.

Bee-keeping as a Cottage Industry

Inaugurating the Indian Council of Bee-keeping in New Delhi recently, Dr. Punjabrao S. Deshmukh, Union Minister for Agriculture, stressed the role of bee-keeping as a cottage industry. He highlighted the importance of honey as a nourishing and efficacious medicine. He pointed to the role bees play as pollinators of flowers. Finally, he considered that the industry had before it a bright future. In fact, his analysis of the current problem of the industry makes interesting reading.

Although the bee-keeping industry dates back to historic days, in India it is still in its infancy. This is due to absence of sufficient attention to the development of the industry. And this in turn is attributable to lack of appreciation of its importance as a subsidiary occupation for the rural population. A notable feature of the industry is that, unlike other cottage industries, it has not to compete with machines. Neither can it be mechanised. during spare hours and gives relaxation to the workers after a hard day's toil elsewhere in the fields, etc.

Honey, the product of the bee-keeping industry, is only next to nectar. It is the choicest gift of nature to man. It contains A, B and C vitamins which retain their rare invigorating properties. as in other sugary products these vitamins are lost during the process of heating. Its utility as nourishing food, efficacious medicine and valuable disinfectant is established beyond doubt.

Production statistics disclose that the aggregate yield of honey in India works out to 10 to 12 million lbs. a year, of which, however, only one-third gets to commercial channels. As compared with India's output, the U. S. produces more than 200 million lbs. of honey. The *per capita* production in India is a fraction of an ounce as against 1½ lbs. in the U. S. and 2½ to 3 lbs. in Canada. In the U. S., there are about 8 lakh persons who in one way or another derive benefit from bee-keeping. In the U. K. bee-keeping has made rapid progress during the last few years. Countries like Russia, Australia and New Zealand have made sizable progress in producing honey.

The value of the bee-keeping industry does not end with the production of honey. The value of insects as pollinators of flowers is enormous. But for the service rendered by bees, we would not be able to enjoy any one of the deciduous fruits such as apples, plums, peaches and cherries or vegetables such as melons, cucumbers, cauliflower and turnips and would have no oil either to eat or to rub our bodies. Cross-pollinated seeds, fruits or vegetables are better, bigger, and perfectly formed. Besides longer yields can be obtained provided a sufficient for about an acre of oilseeds, legumes, fruits or vegetables.

Experience shows that bee-keeping is a profitable business for a small holder who is in need of subsidiary occupation and wants his leisure time to be utilised for some good purpose. As a commercial enterprise, however, bee-keeping can be practised only in localities where honey plants are abundant. The bee-keeping industry should, therefore, be given the attention that is due to it for development on proper lines.

Sports Goods Industries in India

Sports goods industries in undivided India had thrived by leafs and bounds during the last three decades and have successfully tackled the problems of securing the sports goods and gears for the consumption of the countries sports clubs.

Previously sports goods and gears of foreign make were used in India and which always entailed heavy expenditures. But since the start of the sports goods industries in the country, the clubs and other sporting concerns have been getting the articles at a cheaper rate. The supply has also been up to the mark of the demand.

Think of the days when "Tomlinson." "Webro" and "Matchless" balls of the foreign make were used in the footer game in India. Similarly cricket bats and balls, hockey sticks and balls and tennis and badminton rackets of the foreign make had to be used for want of sports goods industries in the country.

In India, Sialkot made the first praiseworthy venture of manufacturing the sports goods and gears. Thanks to the efforts and enterprise of Messrs. Uberoi Limited and also other such concerns that sports goods have been manufactured in this country at a profuse quantity to meet the demands of the clubs in the principal sports centres of the country.

But the partition of Punjab has dealt a blow to the sports goods industries at Sialkot. Below is given an accounts of sports goods industries with a special stress on its future by Messrs. Uberoi Limited.

The component factors that had worked together to bring the industry to its present high pitch both in efficiency and affluence are Capital Investment. Organising Skill, Raw Materials and Skilled labour.

It can be safely asserted that almost the entire investment in the manufacture of sports goods came from the Non-Muslims, Messrs. Uberoi Limited, being the leading concern. Smaller ones also whose number was legion were Hindu concerns splattered here and there by a few Muslim enterprising with insignificant resources. The Non-Muslims having left their factories establishments behind and shifted to the Indian Dominion with all their available resources undoubtedly stand a good chance of renovating the Industry in their new homeland, which is now well on pregressive way.

Uberoi originally transferred his business into a Limited Company about 40 years ago. Other followed his example from time to time. Thus the organising power and experience being all in the hands of non-Muslims it can be predicted that the Industry is bound to revive in the Indian Dominion too.

It is estimated that total investment in the industry now rehabilitated in India amounts to about one crore of rupees including the fixed capital investment and stock in trade. This is a small amount compared to the prospects and progress of the industry in the Dominion of India from the point of views of export trade as well as home consumption.

The raw-materials included two essential ingredients, wood and leather. Kashmir accounted for the manufacture of

cricket bats, Kashmir Beech, Walnut, Ash and other timbers accounted for the manufacture of Tennis and Badminton frames, and other sports goods. Kashmir's accession to the Indian Dominion must bring with it all this timber required for the Industry. Pakistan has nowhere else to look for its supplies.

A deadlock has already come and Sialkot (West Pakistan) cannot now produce any good quality cricket bats or other sports goods made of timbers available in Kashmir.

On the other hand Chhanga Manga (West Punjab) accounted for Mulberry required for the manufacture of hockey sticks. There are no regular plantations of mulberry wood in the Indian Dominion. It will however, take some time before large plantations of Mulberry wood can be made available by starting cultivation on an organised scale.

Pakistan may well secure hides in abundance to meet its needs for the sports Industry. But the Indian Dominion is the home of hide industry. Local consumption in the form of manufacture of footwear in Agra and other places and manufacture of leather cases and other goods is met within the Dominion as the existence of large number of tanneries in United Provinces and Southern India bears out.

Regarding skilled labour in sports goods industries it can be said the Chamars (scheduled caste Hindus) are makers of footwears, saddles and other goods of leather. Their cheap availability and hereditary fitness for handling leather enabled Sardar Ganda Singh Uberoi to put this class enblock in the manufacture of Cricket Balls. Hockey Balls, Footballs, Volley Ball, Basket Balls, and other leather sports goods. This class has now migrated to the Indian Dominion and has thus already joined various concerns of sports manufacturers started in Meerut, Jullundur, Agra and Delhi etc., and as such there now remains no shortage of the skilled labour.

Roughly it is estimated that about 15,000 persons are engaged in this sports industry to make their future prospects ameliorated after the partition by virtue of the atmosphere and resources of raw materials available. U. P. will be the future main centre of sports industry.

Uttar Pradesh is now home of the industry. Meerut is now a centre of the Indian sports industry, following partition and the Government's plans to help the displaced enterprisers of the industry, who migrated from Sialkot, to settle in the same business in this State.

The Industry is already showing signs of stability and goods manufactured cover a very wide range including tennis, squash and badminton rackets, hockey sticks, cricket bats, footballs, volley balls, basket balls, cricket and hockey balls, cricket and hockey outfits, jerseys, sports shirts, bathing costumes and gynasium apparatus. Nearly 57 concerns are engaged in this industry, employing about 6,000 persons, their annual production being nearly Rs. 40 lakhs, one fourth of which is exported to foreign countries.

It is indisputed fact that owing to its disruption due to partition the sport industry could not continue its export trade as before but it is now being rehabilitated with appreciable speed and vigour of the industrialists interested in the industry goods. At present about Rs. 20,00,00 worth of goods are monthly exported to overseas countries namely U. K., U. S. A., Australia, New Zealand, Canada, Belgium, Holland, Egypt, Sudan, Turkey, Malaya, Indonesia, Thailand, Burma, Ceylon etc.

TRADE WITH REDS

The U. S. A. is responsible for the ban imposed by the so-called free world on trade with Communist countries in strategic materials. But despite the ban the Communist countries are not experiencing much difficulty in procuring their requirements of these materials. And what is still more disconcerting, the ban has been ignored by private traders of the free world who are alleged to have smuggled strategic goods quite alright into the red areas. The battle for peace which is now being fought by both Soviet and Anglo-U. S. camps can succeed only if, as a gesture, the two warring camps agree to revive trade between themselves. Restoration of the trade between the two blocs to its normal level may not be regarded as a feasible proposition as long as the war of nerves continues. But there is no reason why the free world should be reluctant to carry on trade with the Soviet group in non-strategic goods. In this connexion one will do well to ponder over the points made by the National Foreign Trade Council of New York in the course of a pamphlet recently circulated by that organisation. The Council rightly holds that any attempt to stop trade with the Russian bloc in non-strategic goods will result in loss on the part of the free world. The pamphlet was issued by the Council to publicise the views held by about 2,300 leading U. S. businessmen who participated in a trade convention in New York some time ago. The following quotations from a recent telegram throw some light on the conclusions reached by U. S. businessmen who have, fortunately, not yet played into the hands of McCarthy and Company:—

The pamphlet said:—"The free world can make good use of the materials and goods which the nations of the Soviet bloc can supply in exchange for what they get.

"The restoration of traditional trade patterns, where they are feasible and where they have economic validity to-day, could serve to lessen existing tensions—both between the free world and the Soviet bloc and within the free world itself."

In the case of Western Europe and Japan in particular, any opportunity to "look more freely to the process of international trade" to satisfy their economic needs should lessen their independence on continued U. S. economic aid.

The convention recommended that the U. S. A. should seek a "middle ground" agreement with her allies on what constituted strategic materials. Agreement should be sought on the basis of which the Western nations could take a concerted and united stand.

"The definitions resulting should be more rigorous than some of those at present sponsored by our allies, but less rigorous than some of those at present sponsored by the U. S. A." it said.

"There is a middle ground which would bring benefit to the economy of our own country and to the economies of the countries friendly to us, without detriment to the security interests of all, which must remain permanent."

PAKISTANI POLICY

As pointed out by Mr. Tafazzal Ali, Pakistan's Minister for Commerce, at a

Press Conference recently held in Karachi. Pakistan desires that trade with her neighbours having a common land frontier with her should be rationalized and stimulated to the mutual advantage of both sides. She also wants to pave the way for stability in commercial relations with her major overseas trading partners. Explaining his country's trade policy further the Commerce Minister said, "The development of trade with muslim countries, with whom we have religious and cultural ties, is also engaging my attention. Problems connected with the promotion of inter-zonal trade between East and West Pakistan, general export promotion and formulation of our shipping and tariff policies will receive high priority."

Pakistan has decided to curtail her imports. This has been necessitated by the fall in earnings from exports. As told by Mr. T. Ali, "The extent to which imports had to be restricted can be gauged from the fact that our total foreign exchange earnings in 1952-53 (July-June) were Rs. 134 crores as against Rs. 219 crores in the corresponding period in 1951-52. Inspite of constant efforts to expand exports—which will be intensified—no material change in the country's ability to earn foreign exchange in the coming year can as yet be foreseen." The Minister rules out the possibility of any large scale liberalisation of the import policy in the near-future, at least till such time as the inherent equilibrium in the balance of current payments is achieved. He hopes that by that time the need will cease for the import of those articles the domestic production of which is said to be progressively increasing in quantity and quality. These articles include jute manufactures, in which Pakistan claims to be self-sufficient already; and other such articles as edible oils, cement, cycle tyres and tubes, metal lamps, sulphuric acid, nitric acid, leather, confectionery, biscuits, woollen blankets, paints, electric fans, brushes and buttons.

INDO-RUSSIAN TRADE

An Indo-Russian trade agreement has been concluded recently to replace the barter system on the basis of which trade between the two countries has been carried during the past three years.

Among the goods which India has agreed to export to the U. S. S. R. during the first year of agreement are: jute manufactures, tea, coffee, tobacco, shellac, black pepper and other spices, wool, hides and skins, vegetable and essential oils and a number of other goods.

The list of goods which Russia has undertaken to send to India includes food-grains (wheat, barley), crude petroleum products, timber and paper, iron and steel manufactures, chemicals, dyestuffs, medicaments, optical goods, cinematograph films, printed matter and other goods as well as a wide range of industrial equipment, including boring, mining, and road-building equipment, excavators, compressors, electrical equipment for textile, shoe, food and polygraphical industries, tractors and agricultural machinery, various machine tools and instruments.

SOIL FOR A GARDEN

A good soil for a garden should present the following characteristics. It should be at least two feet deep, small stones to the extent of not less than 10 per cent or more than 20 per cent. should occur, mixed with the fine portion of the soil.

The particles composing the fine portion of the soil should be in such a minute state of division that when moistened and pressed in the hand, the points of the fingers should not feel gritty matter ; such a soil is called a loam. In an air-dry state it may consist of :—

Small stones	15	per	cent.	nearly
Fine sand	50	„	„	„
Clay and oxide of iron	10	„	„	„
Lime stone	5	„	„	„
Organic matter and water	15	„	„	„
Potash, Soda, Magnesia, Chlorine, Carbonic acid, Sulphuric acid, Phosphoric acid, Nitric acid	each in portion near to ½ per cent.			

Traces of a few unimportant bodies.

If the particles of sand are slightly larger than in our typical loamy soil, the cohesion will be much less and the soil may be described as sandy, and an addition of as little as 3 per cent. of clay, with a corresponding reduction of the small stones will effect the tenacity of a soil so much that it would be described as a stiff retentive clay.

PRUNING

Pruning is the art of removing certain portions of plants with a view to symmetry or the production of more and superior fruits and flowers. It consists of two distinct operations—the cutting out of branches that have reached a considerable size or are decayed or weakly, and the removal of the points of growing shoots. The first operation should be performed only when the tree has nearly finished its growth for the season, because at this time the sap is not running upwards so rapidly as it is at other times, and the wound heals rapidly. If a branch is cut off a short time before the tree begins to grow probably a large quantity of sap will escape at the still fresh wound, and the tree will be greatly weakened by the loss; this is technically called bleeding. The second operation—cutting out the points of growing shoots—may be performed when the plant is in full growth; this system is suitable for keeping herbaceous or soft-wooded plants symmetrical. Sharp tools are necessary in pruning because the wound made by a sharp tool heals more quickly than a ragged wound will do. If it is practicable to cut a branch with a pruning knife, the result is better than any kind of shears produces, because shears are rarely in the perfectly sharp condition necessary for making a wound without bruising the tissues. A saw with an extra thick blade or a thin blade strengthened by a frame is suitable, but the wound made by a saw should be dressed at the edges with pruning knife.

POSITION OF THE GARDEN

In the situation of the garden it is of great importance to have protection from the prevailing winds. If natural shelter is not available the first attention must be given to providing a screen of some kind. For this purpose such trees as are found to grow luxuriously in the neighbourhood may be planted, or if the garden be small and immediate effect desirable, coir or wire matting may be stretched between poles set up at intervals. On the sheltered side of the matting a hardy climber may be planted to improve the appearance of the screen; but the protecting screen must not be too dense or near. What is wanted is

that the air currents may be broken rather than stopped, because a garden where a close still atmosphere prevails will have much fewer flowers than one open to the breeze, which cools the air and causes the dew to fall. The close moist atmosphere is adapted for many kinds of foliage plants and an open airy position for flowering plants.

Regarding aspect a point between east and north is desirable. The east wind is often severe on garden plants but the amount of its mischief will be found less than the intensified sun's rays on the other exposures produced. Moreover, when plants are moist with dew or fresh from cool night the rays of the rising sun appear to have an invigorating effect that is decidedly wanting when the plants have been subject to heat sufficient to evaporate the greater part of the moisture gathered during the night before they are struck by the powerful rays of the mid-day sun.

ENEMIES OF THE MANGO

The mango tree struggles throughout life against numerous depredators; when only a few weeks old the pith at the base of the stem has a special attraction for rats and many young trees are destroyed for a few bites, and it may be necessary to enclose the seedling with wire-netting or lay down mixed with arsenic. Fortunately the season during which the young trees attract rodents is a short one. Leaf eating caterpillars may be trapped by spreading a mat freshly coated with tar on the ground and shaking the branches but a more serious enemy is the caterpillar that infests the pith of young branches; there is nothing for it but to cut off the branch and throw it into a pond where fish may benefit. The large grubs that bore a passage into the wood of the mature branches may be caused to emerge by squirting in kerosin. The grub may be thrown to the crows and the apertur enclosed with a cork or with clay.

When aphides have been sucking the juice of the tree and have covered the leaves with their viscid exudation, known as honey dew, a black fungus thrives on the excretion, and gives the trees a very disagreeable appearance, but as it occupies only the upper surface of the leaf, and is living on the honey dew, the fungus is not doing serious injury, and a few days of heavy rain will wash it off. Surface fungi of this kind may be killed by spraying with 3 per cent. solution of sulphate of iron, hirakas, but the dead fungus must be washed off, if the appearance of the trees is of importance.

CULTURAL ESSENTIALS

A market gardener who wishes to succeed in his business must be in all respects a skilful cultivator and should have gained his practical experience by working through all departments. We summarise here the essentials that must not be ignored and upon the due observance of which most of our instructions and suggestions depend for their efficient application.

1. *Cleanliness.* It does not pay to grow weeds. The destruction of all, but especially those with creeping roots or, abundant, easily dispersed seed, must be followed up vigorously.

2. *Persistent Cultivation*, i.e., the stirring, breaking and deepening of soils, whenever the weather condition permit such operations with safety. The deepening to be preferably effected by the gradual improvement of lower layers, and mixing with the upper portions not by bringing up large quantities at once. When the sub-soil is harsh or unfavourable bringing it to the surface results in a total deterioration of the whole depth.

3. *Maintaining the Fertility.* Constantly adding artificial and organic manure in proportion to the character of the soil and the crops removed, so that the essential elements may always be present in abundance, the physical condition being improved as regards aeration. warmth, and the chemical actions in the oil assisted by sufficient quantities of humus, i.e., decaying vegetable matter chiefly.

4. *Protecting Crops* from Insects & *Disease.* Prompt adoption of measures for the destructon of insects,

and the use of remedies for, or preventives against diseases.

AGRICULTURAL OPERATIONS

For December.

FOR THE PLAIN

Vegetable :—Make sowings of raddish, mustard, cress, lettuce, peas and French beans for succession. Put our fresh plants for knol-khol, cabbage, cauliflower and celery. The most advanced crops of celery will be now in a condition for earthing up to blanch previous to use. Water well celery, squash, raddish, and asparagus seedlings. Withhold water from old asparagus plants that may die down and go to rest.

Fruits :—Gather roselle. Well water cape gooseberries. In the United Provinces the plants should be covered in at night during the cold months. Place seedling bilimois in a warm, sheltered place during the cold months. Towards the close of the months cover again the roots of the fruit trees, that had been exposed, with fresh enriched soil.

Ornamental Plants :—Put down cuttings of aloysia citriodora, heliotrope, geranium, pinks, carnations, habrothamnus, verbenas. Allow to dry down arum pictum, gesnera tubiflora, sprekelia, the varieties of caladium and such other potted bulbous plants. In the United Provinces cover over at night to protect from pest, young heliotropes, tropoeolum, canary creeper, and seedling menhdee plants. Keep under the shelter of a warm varandah Ixora Javanica, hoyas, and vanilla plants that are in pots. Make successive sowings of such quick growing things as browallia, linari, suplea, mignonette, French marigold and concolvalus major. Asters, cinerarias, and pansies will require re-potting in a richer soil.

FOR THE HILLS

Vegetables :—There is scarcely anything to be done this month, and the remarks for last months will apply equally for this one. If it is thought worthwhile, some of the latter seedlings from October might be kept in frames with a hot-bed; but as a rule, English vegetables are in full season in the plains during this and the next two months, and residents of the hills obtain their supplies from this source during the winter.

Fruits :—There is nothing to be done during this month out of doors. Most of the fruit trees will have shed leaves, and will soon be putting on their winter mantle of snow.

Flowers :—The remarks for the last month made in our previous issue will apply equally for this. Water should be entirely with-held from all plants except those that flower during the winter, and these should be sparingly supplied—just enough to keep them alive.

AGRICULTURAL OPERATIONS

For January

FOR THE PLAINS

Vegetables :—From this month forward vegetables of every kind will need to be constantly watered, and if once or twice a week with liquid manure, all the better.

Water squashes every day copiously. Make sowings of Raddishes, Mustard, Cress, Spinach, and Lettuce for a succession. In the Upper Provinces peas may also be sown during this month; but not in Bengal. Sowings of Celery may now be made for young plants to preserve through till the following cold season, if thought worth the while.

Put out young plants of Cabbage and Knol-khol to fill up vacant places in beds. Put out young celery plants for succession.

Celery will now be in a condition fit for earthing up to blanch. Keep a few plants of lettuce, Mustard, and Cress for seed. Reserve one or two of the earliest formed heads of Artichoke for seed in Bengal; it is not necessary to do so in Upper India.

The plants should now be taken up for the manufacture of Topioca and Arrowroot.

Fruits :—Strawberris will now be blossoming and fruiting, and will require to be well watered; and nets or other means provided to protect them from birds.

Water Loquats copiously. Peaches, and Phems should now be pruned.

Ornamental Plants :—Commence giving surface-dressings of fresh cow manure to Roses.

Chrysanthamums will have done flowering, and should be taken out of their pots, pulled to pieces, and put in a nursery bed for a supply of new plants.

FOR THE HILLS

Vegetables :—There is little that can be done in this month. As a rule the ground is covered with snow, and very few of the ordinary vegetables survive the effects of the "white mantle." The work, therefore, in the vegetable garden is at a standstill.

Fruits :—The same may be said of the fruit garden. It is not known if fruit are grown under glass on any of the Hill stations, but even if they were, all that can be done is to maintain an equable temperature in the house, ranging between, 50° and 60° Fahr.

Flowers :—In the flower garden out of the doors, the ground being covered with snow, it is impossible to do anything. It is assumed that such plants as need the protection of the stove or green house have been sheltered therein. Others that are left out of doors, such as roses, etc., should be looked at occasionally to see that they are properly sheltered. Care must be taken not to allow the temperature in the stove to go below 50. Fahr, at night. About this time a careful search should be made for insect pests, which should be destroyed or they will bring their depredations on the first approach of spring.

Scientific Researches and Invention

HOW OLD IS THE UNIVERSE?

The age, size, and apparent rate of expansion of the universe were discussed by Dr. Edwin Hubble, of Mount Wilson and Palomar observatories, California, when he delivered the George Darwin lecture of the Royal Astronomical Society in London.

The effect of recent evidence, largely by Dr. W. Baade of the same observatories, is that all estimates of distances outside our own galaxy of stars must be roughly doubled and that the estimated age of the universe must be doubled also from about 2,000 million years to between 3,500 and 4,000 million years.

The conclusion about the age of the universe is reached in this way. If the rate of expansion at any distance is taken as known then it is possible, working backwards, to calculate the length of time which must have elapsed, measured from the beginning of expansion, to reach the present stage. But if the distance measurements are doubled while those of speed of movement remain the same then the time needed to reach a given stage of expansion must be doubled also.

The new figure for the age of the universe—3,500 to 4,000 million years—is comparable with that deduced for the age of the earth, one recent estimate being about 3,000 million years. It removes a difficulty that the earth was in some danger of seeming to be older than the universe.

UTILISATION OF BY-PRODUCTS

Many large-scale Indian processes in chemical, metallurgical, food and other industries yield a great variety of by products which find very little use in this country. It is learnt that preliminary trials with boiler ash from the giant Sindri Fertilizer Factory have shown that it has distinct possibilities as a raw material for hydraulic cement. As a cement factory will be set up in the Sindri area, this discovery may achieve a considerable saving by permitting use of 25 per cent ash. Lime slag, a waste product from sugar refineries and tanneries, when mixed with sodium silicate can be employed for stabilization of soil. This process may find use in preparing a base for light-traffic roads, or for making building blocks or for other building purposes. The Central Building Research Institute of Roorkie has, it is reported already suggested the use of blast furnace slag in the production of Portland cement.

RADIOACTIVE CORTISONE

Cortisone is an effective drug against arthritis. Information has been received that radio-active cortisone has recently been produced for the first time under the direction of the U. S. Public Health Service It is reported that the physicians will be able to use the fractional amount produced in about 2000 experiments to trace the action of cortisone on arthritis, leukemia and other ailments. The U. S. Atomic Energy Commission, it is reported, supplied the radio-active carbon that was "hooked into" the molecules of the drug.

ISOTOPE PRESENTS DYE CONTAMINATION

An interesting use of isotopes in the textile industry is for the preservation of pure, bright colours in fabric printing When a length of fabric for curtains or dress material or the like is being printed in more than one colour there is a danger that small portions of the colour from one of the dye baths on the printing machine will find their way into the baths containing the other colours and thus spoil their purity. It may often be quite impossible to detect this "dye contamination," as it is called, by eye because the dyes do not show their final colours during the printing stage. The fabric has to go through further processes before its true colours are seen Specialists concerned with the industrial development of isotopes found a simple

solution of this problem. They worked out a method of mixing a known quantity of a suitable radio-active isotope with the dye in one of the baths on the machine. Besides the other dye baths they fixed up a detector to pick up and measure the radiation given off by this isotope. In this way it was possible to find out immediately whether any of the "radio-active dye" from the first bath was finding its way into the other colours and the detector would automatically give a warning signal so that the dye could be changed before the colours were spoiled. The isotope used in the process has a very short life, so once again, there is no question of any danger to the user of the fabric.

NEW T. B. DRUG TESTED

News has been received of the development of a new drug which promises to prove a helpful companion to streptomycin in the treatment of tuberculosis. This is *HES*, hydrozyethel sulfone, originally reported to be synthesized at the National Institute of Health, main research centre conducted by the U. S. Public Health Service. A group of physicians at Howard University, Washington, have, shown that the combination of two drugs when used on 57 patients produced better results than were obtained on similar groups receiving steptomycin alone. The new drug appears to be effective against streptomycin-resistant infections also.

PHOTOGRAPHING THE SUN FROM 80,000 Ft. Up

British scientists are now putting finishing touches to a giant plastic balloon which is to carry a telescope camera to a height of 80,000 ft. to obtain unique pictures of the sun.

The main aim is to photograph the corona—the area of faint light surrounding the sun and normally visible only during a total eclipse.

By sending an automatic camera fitted to a big telescope to 80,000 ft. by a special balloon, astronomers hope to defeat the dust and haze obscuring the sky at lower heights and so get clearer pictures than have ever been achieved before.

In taking the photographs, a mirror mechanism ensures that one mirror collects light from the sun and sends it up a telescope tube, and it is then reflected by a second mirror at the top of the tube down into the camera.

A further mechanism will operate the parachute to bring telescope and camera down to earth. The equipment will be in a special waterproof casing which will float if it lands in the sea.

A reward will be offered to anyone who finds the parachute and its telescope camera.

Professor Roderick Redman, chief of the astrophysics department of Cambridge University, is controlling the preparation of the telescope camera and its ancillary equipment, while the great plastic balloon, measuring 120 ft. in diameter, is the work of Nobel Prize winner Professor Cecil F. Powell, of Bristol University, and his team of assistants.

Bristol University has long taken the lead in experiments with giant hydrogen-filled balloons for cosmic-ray research, and one of its products is now being used in a cosmic-ray expedition operating from Sardinia.

Professor Powell is hopeful that "from the thousands of photographs with the camera operating every five seconds, we shall obtain at last a few good pictures."

BOOK IN PHOTO TYPE

A new photoelectric typesetting machine which eliminates the use of metal type has been completed by the Graphic Arts Research Foundation, Cambridge, Massachusetts.

The first book composed on the new device was presented recently to the Massachusetts Institute of Technology.

The new development photographs characters on a rapidly whirling glass disc and produces a film from which the desired copy is photoengraved on plates for printing. The machine activated by the standard typewriter keyboard.

The inventors are Rene A. Higonnet and Louis M. Moyroud, two telephone engineers of France. The process was developed by the Graphic Arts Research Foundation, which has licensed Photon, Inc., to manufacture the machine. The Foundation has spent $ 1,000,000 since 1949 on research and producing a pilot machine.

COMMUNICATOR FOR BLIND

A new machine—a miniature typewriter—to enable the blind and the deaf-blind to receive messages from the sighted who do not know Braille has been demonstrated in New York City. The machine, known as the " A. and S. Communicator," was invented in Denmark. The device has an ordinary typewriter key board that punches Braille letters through a platform to the fingers of the blind. The machine is not yet on the market.

NEW RUST-PREVENTIVE

A new method of preventing rust and corrosion from forming on metal products has recently been perfected in the United States.

The new product, called Vapour Phase Inhibitor, or VPI, is being used to protect such a variety of products as small machine parts, airplane engines, wire, hand tools—even tiny watch parts and huge diesel-engine crankshafts.

VPI is a chemical called dicyclohexyl ammonium nitrite. Its rustprevention qualities were discovered by the Shell Oil Company, New York City. VPI was added to the crude oil, and the effect was amazing. Not only did the pipes remain rust-free, but inspection domes, out of reach of the flowing oil and presumably untouched by the chemical, remained bright and free from rust.

VPI crystals and/paper are being used with geat success to protect the inside of aircraft engines during storage by several airlines.

IODINE FOR ARTHRITIS

Two British doctors report that treatment of rheumatoid arthritis is being aided by the use of iodine. The doctors say they accidentally discovered the effectiveness of iodine in this field several years ago and have been using it since with good results.

SYNTHETIC DIAMOND

The National Lead Company, New York City, has developed a synthetic gem as brilliant as a diamond. One curator described the stone as having " as much brilliance as a diamond and considerably more fire." The material is strontium titanate in the form of a large single crystal made by a fine fusion process.

FLOW RATE MEASURED

A new instrument capable of measuring the " true mass rate of flow " of anything that passes through a pipe has been developed by the Control Engineering Corporation of Norwood, Massachusetts.

The meter is noted for its accuracy, and is called unique in that it gives direct reading in terms of weight (pounds per minute) rather than in volume. Unlike other measuring meters, it is not affected by temperature, pressure, compressibility or external accelerations. The unit is found to be especially adapted for measuring the weight flow of grain into a hold of ship or petroleum into tankers.

Engineering Notes

TIPPER TRUCK FOR BULK GRAIN TRANSPORT

A tipper truck for the bulk transportation of grain from farm to mill has been produced by a British firm. The vehicle holds seven tons of grain, which is loaded through the open top and emptied by tipping direct into conveyors which convey it to storage bins. The tare of the vehicle, on a Bedford short-wheelbase chassis, is low enough for it to be registered in the 30 m.p.h. class, making it economical in operation. This has been achieved by constructing the body in light alloys. Normally, grain is discharged through a trap which is manually adjusted to control the rate of flow accurately in conjunction with conveyor speed. But for speedier emptying the lower half of the rear end—which is hinged—can be dropped like the tailboard of a truck. If need arises to load sacks, a pair of vertically hinged doors above the drop board can be swung back for easy access.

NEW SMALL DIESEL AIDS THE FARMER

A new small diesel engine has just been introduced by a British firm. During a four years' test, made under rigorous practical conditions to discover any weakness that might develop, one of the prototype engines ran over 400,000, ,000 revolutions. The engine provides from 5 h.p. at 1,000 r.p.m. to 8 h.p. at 1,500 r.p.m. Easily started and quiet-running it is designed to meet all requirements for a small prime mover in Britain and abroad. It is particularly suitable for manufacturers of contractors' plant, agricultural machinery and diesel-electric sets, and is already in considerable demand from overseas, principally for agricultural and irrigation purposes. Demand for the diesel for water-pumping for agricultural purposes is particularly strong from India, the company reports. The makers have a large export trade and last year sold their products to more than 50 countries.

A NEW MATERIAL FOR UPHOLSTERING MOTOR CAR

A new Austrian high-quality material for the upholstering of motor car and motor-coach seats has been brought on the market, under the trade mark "Perfectly." The material consists of a plastic layer inseparably and indissolubly connected with an extremely wear and tear resisting fabric layer. "Perfectly." plastic-fabric material is washable and waterproof, resistant against blows and scratches. The material is furthermore highly resistant against ageing, since it neither becomes brittle nor changes its structure after prolonged use.

WATERPROOF LIQUID FOR BUILDING SURFACES

A new colourless waterproof liquid for application to most forms of building surfaces will be on show at the Birmingham section of this year's British Industries Fair (which is opening on April 27). Made by a London firm, the liquid has a life more or less equivalent to the life of the surface to which it is applied, and it cannot be distinguished on treated surfaces. It is described as 100 per cent waterproof and has the added properties of preventing subsequent staining by dirt on brickwork.

The company will also display a concrete curing liquid whose application—by brush or spray, immediately after placing or final trowelling—obviates the need for the method of curing with damp sawdust, sacks, etc., and the constant flooding with water. The curing liquid forms an impervious film over the surface of the concrete, so keeping the original water content from evaporating and thus insuring complete hydration of the cement without trouble or additions of water to the surface. An important factor is that floors treated with this liquid can be put into use during the curing period.

NEW MACHINE FOR LAUNDRY-MARKING

Described as introducing a revolution in laundry-marking equipment, a machine of a new British pattern provides a non-permanent, removable mark which, while identifying the article when at the laundry, leaves no trace for the customer to see. This is a small tab which the machine automatically heat-seals to the garment to be marked. One end of the tab remains unsealed, to provide a finger grip for its removal before the garment is returned.

A shipment to North America of 12 machines was recently made, and is to be followed by despatch of some 40 to 50 a month. This is the result of a sales promotion tour which yielded orders worth approximately $ 250,000. Besides these latest deliveries to the U. S. A. and Canada, which will make a valuable contribution to the dollar drive, the system has been installed in laundries in Britain, Australia, Belgium, Denmark, Finland, France, Germany, the Netherlands, New Zealand, Rhodesia, South Africa, Sweden and Trinidad.

NEW-TYPE FLOORS

Building of residential flats in a Lancashire town has been speeded up and costs reduced by the introduction of a new-type wooden floor designed by the Deputy Borough Surveyor in conjunction with the British Department of Scientific and Industrial Research. This floor provides structural stability, and fire-resistance equal to concrete about five inches thick. The sound insulation shows that absorption of "aerial sound" people talking and radios—is similar to that for concrete floors, but floor—is slightly better. In addition to savings in cost, saving in building time is considerable as, instead of having to wait for concrete to set, builders lay the floors and go right ahead with the work. It is claimed that on each new flat built the floors save £. 80, and in the past 12 months nearly £. 11,000 has been saved by the local authority.

INDIGENOUS MOULDING SANDS

An investigation has recently been completed at the National Metallurgical Laboratory, Jamshedpur, on the suitability of indigenous foundry sands for use in the production of piston ring castings.

The production of piston ring castings in India has been hindered due to lack of suitable moulding sands. The moulding sands suitable for piston ring castings may be of aeolian origin with certain specific characteristics. In India, sand deposits of aeolian origin are chiefly confined to desert sands of Rajasthan and sand dunes located along the east coast. Of these, deposits of desert sand near Jaipur, which extend over a stretch of 400 miles, appear promising. Other sand deposits, having high silica content and of suitable shape and size, are located at Ernar village in Madras State, Talakad in Mysore State and Shertallai taluk in Travancore—Cochin State. These sands compare favourably with foundry sands employed in piston ring castings in the United Kingdom.

MINERAL CONCESSION RULES

Certain amendments have been made by the Government of India in the Mineral Concession Rules, 1949, for ensuring the smooth disposal of applications for prospecting licences and mining leases. Under the Rules of 1949, when more than one application was received for prospecting licence or mining lease for the same land, preference was to be given to the application received first, unless the State Government, for any special reasons and with the prior approval of the Central Government, decided to the contrary. The amendment provides for the contingency of more than one application being received on the same day. In such cases, the State Governments are now empowdered to consider the experience in prospecting mining, and the technical staff of the applicants and grant the prospecting licence or mining lease to the applicant considered most suitable after obtaining the prior approval of the Central Government. Where applications for both a prospecting licence and a mining lease for the same land are received on the same day, the amendment provides that the application for a mining lease shall not have any preference over the application for a prospecting licence, except in the case of an area which was held and worked under a mining lease previously.

The amendment Rules also require the State Governments to specify the dates of expiry or relinquishment or cancellation of licences and the dates from which the areas are available for regrant in the register of prospecting licences maintained by them.

FOREIGN EXCHANGE FOR AUTOMOBILE ASSEMBLERS

Reports from New Delhi indicate that the Government of India has allocated to assemblers of automobiles only so much of foreign exchange as will keep them going upto the end of 1954. The assemblers are stated to have been given freedom to use foreign exchange in any manner so as to phase out the closure of their plants by that time. Five hundred motor cars are expected to be the maximum that can be assembled during this period from the foreign exchange resources allocated.

PROTECTION TO HYDROQUINONE INDUSTRY

The Government of India has raised, in accordance with the recommendations of the Tariff Commission, the preferential rate of duty on hydroquinone from 27.3 per cent. to 50 per cent. ad valorem (inclusive of surcharge), the standard rate being adjusted in accordance with the terms of the India-U.K. Trade Agreement. The enhanced rate will remain in force up to 31st December, 1955. The Government has also accepted two ancillary recommendations of the Commission. First, the cost of production for sulphuric acid in India should be examined and, if necessary, suitable action should be taken under the Industries (Development and Regulation) Act to maintain the prices of this essential material at a reasonable level. Secondly, the Sindri Fertiliser Factory and the ordnance factories should jointly examine the possibility of manufacturing synthetic nitric acid, nitro-benzene and aniline.

IMPORT POLICY FOR WOOLLEN GOODS

The Government of India's import policy for wool and woollen goods for the current half-year, announced recently, has been welcomed by traders. The policy envisages liberalisation of imports of handknitting wools. Thus, the quota has been increased from 75 per cent. to 100 per cent.; an import licence for Rs. 100 will be granted for every Rs. 75 sanctioned in the previous half-year. What is more, the period of validity of import licences is extended from six months to one year. Applications from newcomers are also being considered. These changes in the import policy, it is stated, will enable importers to secure delivery of hand- knitting yarns at a more appropriate time to

meet consumer demand for the coming winter and, if they so desire to import two consecutive sixmonths quotas in one delivery only.

Another welcome feature of the new policy is the inclusion, albeit on a token basis, of carpets and rugs in the list of imports. Established importers are permitted 5 per cent. of their approved quota and the validity of the licence will be only for six months.

The quota for wool fabrics generally, excluding felt or fabrics made of shoddy or waste wool, is unchanged at 25 per cent. but the validity of ilcences for these three varieties is up to 31st March, 1954. Licences for import of raw wool (marine and crossbred) and wool which are on O. G. L.XXX will be valid till the end of September next.

FORWARD MARKET COMMISSION

The Government of India will shortly appoint a Commission to regulate and control forward markets in India. The Commission will be a permanent and statutory body and will have jurisdiction over commodity markets only. The forward trading on Stock Exchanges will be governed by a separate Bill now under preparation. The Forward Markets Commission will have power to control the forward markets and to amend, when necessary, the by-laws of any market or to impose certain conditions.

STANDARD FOR POWER ALCOHOL

Standard for power alcohol has been issued by the Indian Standards Institution (I. S.I.). The standard prescribes requirements and methods of sampling and test for this material which is used either by itself or in admixture with petrol as a fuel for automobile engines. The standard defines power alcohol to include partially or completely denatured methyl alcohol only and does not include blends that may be produced for marketing motor fuels. This standard is one of a series of five Indian standards on materials containing ethanol.

EXPORTS OF IRON AND MANGANESE ORES

The Government of India has announced its policy regarding exports of iron and manganese ores. According to it, it has decided, as an interim measure, not to alter the existing procedure for the grant of export licences for the export of these ores from ports other than Calcutta and Madras. Exports from the ports of Calcutta and Madras will, however, be allowed for the time being on the basis of past performance of the shippers and the eligible shippers will be granted export allocations equal to 25 per cent. of their best exports during any of the three financial years ended March, 1953. The quotas allotted to individual shippers will be valid for shipment during the period 16th October to 31st December, 1953. Shippers who are able to ship their allotment in full before 31st December, 1953, can apply for additional allotment to the respective Export Trade Control Officers. The Government of India has also proposed to consider the question of giving mine-owners, who are not eligible to receive export allotments, as established exporters, but would like to enter the export trade, an opportunity to export these ores. With effect from 16th October, 1953, railway wagon allotments will be made only to holders of export allotments. The railways will register indents in accordance with the usual procedure and make allotments prorata in order of registration.

IMPETUS TO HANDLOOM INDUSTRY OF INDIA

The Government of Bihar was approached the Government of India for approval and financial assistance to its scheme, designed to give an impetus to handloom weaving industry in the State. The salient features of the scheme are :

(1) Adoption of improved methods of manufacturing handloom cloth ;
(2) setting up of a finishing plant and dye works for handloom fabrics ;
(3) making available yarn to weavers at cheap prices ;
(4) opening of sales emporia in and outside the State ;

(5) establishment of handloom research and design centre ;
(6) ensuring quality of handloom textiles ;
(7) organisation of weavers co-operative societies , and
(8) marketing of products of handloom industry. There are over 2 lakhs of weavers in Bihar.

EXPORTS OF CLOTH

The Government of India has extended the period of the free licensing of cotton textiles up to the end of June, 1954. Accordingly, the licences for exports of cotton piecegoods and manufactures other than cotton waste blankets, which are due to expire on 31st December next, will remain valid for a further period of six months. The licensing procedure and other conditions will, however, remain the same.

The above decision of the Government is a sequel to the surfeit of cloth supplies, consequent on the steady and perceptible improvement in output in the past few months. But the extension of the shipment period, in itself, will not lead to any significant rise in exports. True exports of cloth in recent months have shown a slight improvement, the quantity actually shipped during the months of August, 1953, being 62.7 million yards, as against 56 million yards in July and 52 million yards in June. The aggregate exports for the first eight months of the year amounted to 435 million yards, which compares favourably with 379 million yards in the same period last year. The following table gives the trend of exports during these eight months, as compared with the corresponding period of 1952 :—

		(In million yards)	
		1953	1952
January	..	43.4	30.7
February	..	38.6	29.4
March	..	53.9	22.4
April	..	63.6	26.0
May	..	64.5	49.4
June	..	52.1	68.9
July	..	56.0	69.4
August	..	62.7	82.6
TOTAL	..	434.8	378.8

The improvement in cloth exports noted above, it is, however, stated, has been due mainly to the delay in the shipment of cloth in previous months in expectation of the abolition of export duty and partly to the eagerness of Burmese importers to get into their country as much cloth as possible before the end of this month when the Burma Government's Imperial Preference policy ends

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CHROME ORE EXPORT

The Government of India has decided to permit the export of 15,000 tons of chrome ore, irrespective of grade, during the period January-June 1954, exports will be permitted by established shippers and mineowners with ready stocks.

Allotments will be made to established shippers on the basis of 100 % of half of their best year's exports during any one of the four financial years ending March 1953. They are advised to submit their applications, together with statements of the best exports duly supported by documentary evidence, to the Export Trade Control authorities at the ports not later than Jan 25.

The announcement also invites mineowners to apply for export allotments not later than Jan. 25, to the Chief Controller of Imports and Exports, New Delhi, together with documentary evidence to show :—

(*a*) Quantities that have already been raised by them and available for export at the pit or the railway sidings, as on Nov. 30, 1953.
(*b*) Quantities actually mined during each of the four financial years ending March 1953, duly certified by the officer in charge of the Mining Department of the State Government.
(*c*) Quantity sold during each financial year with particulars of sales.
(*d*) Royalty paid to the State Department.
(*e*) Quantity actually exported by them, if any, during each of the four financial years ending 1953 and the quantity for which they have applied as established shippers.

THE INDIAN TEA INDUSTRY

Sri Satyendraprasad Roy, Chairman of the Indian Tea Planters' Association, in his presidental speech at the annual general meeting of the Association held at Jalpaiguri thus said :

"No less than 100 crores of rupees are sunk in the tea industry ; it brings about 80 crores of rupees in foreign exchange every year. It yields about 12 crores of rupees to the Central Government in export and excise duties and almost double that amount in customs revenues, income tax, agricultural income tax, sales tax and in other levies to the exchequer. Next to Railways it is the biggest customer of our coal mining industry ; it gives employment to 15 lakhs of our nationals; since our National Independence, it has given impetus to the formation and development of our Tea Chest Industry and small tools industry and fertilizer industry. A big slice of our railway revenue is earned by carrying tea and tea stores ; tea dividends are a substantial source of income to thousands of small shareholders ; and the business of supply and transport of tea stores, have been the means of livelihood of many a middle class family."

" During the period of our dependence under a foreign rule, we could not help being almost exclusively an agricultural country with our emergence as a free nation, we have to make good the leeway if we are to march alongside with other free nations towards the goal of industrial sufficiency."

" The outstanding event of the year 1952 has been a crisis of unprecedented magnitude which held the Tea Industry in its grip. The prices began to sag towards the close of 1951, and recorded a steep fall during the first quarter of 1952 : the downward trend continued steadily till September the prices stabilised at -/6/- to -/8/- below the cost of production. The slumping of the price affected heavily the gardens of North East India except Upper Assam, with the result that the year 1951 closed badly for those gardens who could not sell all the bulk of their teas within that year."

" The most obvious reason of the latest crisis has been overproduction. A comparison of the out-turn records of India, Ceylon and Indonesia as collected by the International Tea Committee between the years 1934 and 1951 show that the total production of these countries have gone up by about 50 % while the Indian production alone has increased by about 75 % since the first International Agreement but the imports by the consuming countries rose according to the same source from 849 million lbs. in 1934 to 949 million lbs. in 1951 or only by 12 %."

By the end of November 1952, the finance bottleneck was such that many Indian estates could not pay the Central Excise duty for factory clearance of tea; worst hit estates had already closed or were issuing notice of closure; mass unemployment of plantation workers was in the offing.

" In response to repeated appeals from the Indian section of the Industry, for assistance in securing finance for running the garden in 1953, the Central Government announced a scheme of Government guarantee to the Scheduled Banks to cover their losses if any up to a certain limit on the hypothecation account of 1953, as an inducement to the said banks to continue financing the gardens in 1953."

" Though this Association's attempts for a reduction of crop failed in the early part of the year, stern realities ultimately compelled those producers who were originally opposed to a planned restriction of production to change their views. At a Conference of the representatives of Associations of Tea Producers held on 18th December, 1952, the principle of voluntary restriction of production was accepted, whereby Indian tea crop would be reduced to 570 million lbs. in 1953."

"Immediately after the decision of the Indian producers to cut down the crop from 621 million lbs. in 1951 to 570 million lbs. in 1953 the tea prices began to rally. When the market opened in 1953, there was a stronger demand, and the prices recorded a steady upward tendency since the beginning of the current year."

India produces a little over 600 million lbs. of tea as the largest tea growing country in the world; she is also the largest Tea exporting country; in fact we consume not more than 25 % of what we produce and send out 75 % to the export markets. This dependence on foreign markets is the basic weakness of our Tea Industry. Now with the world production exceeding world demand the industry has been confronted with a crisis which has shaken it to its very foundation.

"So, while we must be unremitting in our efforts to earn foreign exchange with our tea, by developing our overseas markets, we will at the same time secure the industry on a sound foundation by having a strong home market."

"The current Indian consumption of tea is in the neighbourhood of 150 million lbs; this with a population of 360 million reduces to .42 lb. per capita. Compared to every cup of tea taken by the Indian, the Briton takes 22 cups, the New Zealander 18 cups, the Irishman 16 cups and the Canadian 8 cups."

Coming nearer home we may take a lesson from our neighbour the Chinese. We have no figures of China's current production or consumption of tea: the pre-war Chinese production was estimated at 400 million lbs. the whole of which was consumed internally: with the prewar population of 400 million the consumption per capita was 1 lb. or double that of Indian consumption.

The crisis has had a bitter lesson for the estates under Indian ownership and management, the majority of which are below 500 acres under tea.

"Though the tea industry of India was cent per cent European originally, and had a sprinkling of Indian interestst after the late eighties and till the first World War, Indian ownership came to occupy a definite place in the industry during the short period between the first and the second tea crisis."

INDIAN PUMP INDUSTRY

In the course of his presidential address to the first annual general meeting of the Indian Pump Manufacturers' Association held at Bombay on 30th October, Mr. M. W. Gurjar pleaded for an extention of the range of restrictions on imports of pumps. At present, there are only restrictions on the import of pumps upto 6", but Mr. Gurjar wanted the restrictions to be extended upto 10". In fact, we wanted that imports of pumps upto 6", should be completely banned. He further pleaded for raising the import duty from the extising 10½ per cent. to 30 per cent ad valorem.

It is stated that there are huge stocks of pumps with the various manufacturers and that the installed capacity of the industry is adequate to meet the entire demand for centrifugal pumps from 1" to 14". The Planning Commission has fixed a target of 85,000 centrifugal pumps a year. There is a section which feels that this estimate errs on the high side. In support of this view, it is pointed out that the Indian pump manufacturers are finding it difficult to sell their goods. At present, there are 20 organised factories, with a rated capacity, assessed on an 8-hour single shift basis, of 128,000 pumps per annum. The actual production of these and some other smaller factories is estimated at about 50,000 pumps.

Mr. Gurjar, touched the subject of exports also. He made out a case for unlimited exports without any further delay, in view of the difficulty in selling pumps at home.

DUNCAN BROTHERS AND CO. LTD.

The directors of the above Company (Chairman : Mr. J. R. Vernede, Calcutta) submit the audited accounts of the Company for the year ended 31st December, 1952.

The revenue profit for the year amounts to Rs. 31,36,973 (Rs. 41,24,038) to which is added registration fees Rs. 101 (Rs. 743), E.P.T. post-war refund Rs. 1,63,520 (*nil*), and balance brought forward from 1951 Rs. 2,07,314 (Rs. 2,12,315), making a total of Rs. 35,07,908 (Rs. 43,37,314). From this sum the directors have made the following appropriations :—

Provision for taxation Rs. 16,50,000 (Rs. 16,00,000) and transfer to investment reserve Rs. 5,00,000 (*nil*) leaving a sum of Rs. 13,57,908 (Rs. 12,87,314) which the directors recommend should be distributed as under :—

In payment of a dividend on 45,000 tax-free cumulative preference shares at the rate of 4 (4) per cent. for the year ended 31st December, 1952 without any deduction for income-tax paid by the Company, declared payable by the directors on 31st January, 1953 Rs. 1,80,000 (Rs. 1,80,000) in payment of a dividend on 90,000 ordinary shares at the rate of 10 (10) per cent. for the year ended 31st December, 1952, without any deduction for income-tax paid by the Company Rs. 9,00,000 (Rs. 9,00,000) and in carrying forward Rs. 2,77,908 (Rs. 2,07,314).

Provision for taxation is considered adequate to meet outstanding assessments both in India and Pakistan at current rates of exchange.

As foreshadowed in the last report the disastrous fall in tea sale prices which continued throughout 1952 had its inevitable effect on the Company's revenue from this important side of the business. Since the turn of the year, however, measures taken to secure equilibrium in supply and demand have tended increasingly to exert their influence and auction prices in the world's markets have recovered to a level when producers can again expect some reward for their labours. While therefore the position in recent months has greatly improved many of the cuts imposed in estate expenditure cannot be continued indefinitely and losses incurred have been of a magnitude that the most conservative policy in the future will be necessary if tea companies are to be restored to their previous stability. Statistically the outlook for tea is sound with consumption once again showing a slight upward tendency.

Reduced demand for manufactured goods accompanied by a general fall in the price level over the year had its effect on the prosperity of the jute industry and on the Company's earnings from that source.

For similar reasons the subsidiary Company in Pakistan has reported a lower level of profits than in the previous year, but taking into account the seriousness of the crisis affecting the tea industry and the recession in raw jute prices results achieved are not unsatisfactory.

Although since the close of the period to which these accounts relate there has been a welcome improvement in Stock Exchange values for many of the Company's investments it has been deemed prudent to set aside the sum of Rs. 5,00,000 from profits to investment reserve.

Accounts in brief are as under :—

Liabilities	Rs.	*Assets.*	Rs.
Capital -- --	1,35,00,000	Block -- --	18,22,180
Reserves -- --	50,14,618	Stock of stores etc. --	2,39,083
		Debts, deposits and advances -- --	1,36,31,425
Provision for taxation	21,48,359	Investments -- --	1,70,07,864
Liabilities -- --	1,19,36,168	Cash -- --	1,76,501
Profit and loss account	2,77,908		
Rs. --	3,28,77,053	Rs. --	3,28,77,053

NTRAL INDIA COAL-FIELDS LTD.

The directrs of the above Company (Managing Agents: Hindustan Investment Corporation, Ltd., Calcutta) submit the audited acconuts of the Company for the year ended 31st March, 1953.

After writing off Rs. 1,22,250 (*nil*) paid for share brokerage and providing Rs. 1,00,000 (*nil*) for depreciation and adding the balance carried forward from the last year there is available a sum of Rs. 1,27,963 (Rs. 8,776 after adjusting the previous year's debit balance of Rs. 2,89,495) on the credit side of the profit and loss account. The directors propose to distribute this amount in the following manner:—

To pay dividend on 4,99,700 shares on ordinary shares at As. 4 (*nil*) per share free of income-tax Rs. 1,24,925 (*nil*) and to carry forward Rs. 3,038 (Rs. 8,776).

The progress of the work achieved during the year was better in comparison to previous year. The raisings at Pure Chirimiri Colliery were about 22 per cent. higher than the last year. The production might have further increased but was kept down according to the availability of wagons to avoid further accumulation of stocks.

Accounts in brief are as under :—

Liabilities.	Rs.	*Assets.*	Rs.
Capital	49,97,000	Block	33,74,722
Reserves	1,00,750	Stock of coal	1,65,388
Liabilities	1,69,218	Stock of stores	4,36,050
Profit and loss account	1,27,963	Other assets	18,934
		Depts, deposits and advances	8,54,662
		Investments	1,32,250
		Cash	4,12,925
Rs.	53,94,931	Rs.	53,94,931

DYSENTERY CURE

Castor oil	1	oz.
Gum acacia	3	dr.
Sugar	3	„
Caraway water	4	oz.

Add 1 ounce of the water to the gum. Then add oil gradually and stir. Then add water to make 4 oz.

Adult dose :—15 drops to 1 dram.

EFFERVESCENT TABLET

Potassium bicarbonate	2	oz.	245	gr.
Sodium bicarbonate	17	„	157½	„
Tartaric acid	3	„	367½	„
Citric acid	2	„	105	„
Sucrose	2	„	105	„

Mix the ingredients in coarsely powdered condition. Then compress into tablets.

ELIXIR PAPAIN AND DIASTASE

Papain	15	grm.
Diastase	15	„
Solution amaranth	3	c.c.
Compound spirit of orange	3	„
Alcohol	180	„
Glycerin	300	„
Distilled water to produce	1000	c.c.

Mix the compound spirit of orange with the alcohol, add the glycerine, talc, and 400 c.c. water. Use the mixture to make paste with the papain and diastase, and allow it to macerate for 24 hours or more. Filter and add sufficient water to bring the volume well up to 1000 c.c. Add the solution of amaranth.

FLUID EXTRACT OF PUDINA

Pudina, in coarse powder	100	grms.
Alcohol	600	c.c.
Distilled water	300	„

Mix 600 c.c. of alcohol with 300 c.c. of distilled water, and having moistened the powder with 340 c.c. of the mixture, pack it firmly in a cylindrical percolator then add enough menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop from the percolator, close the lower orifice, and having closely covered the percolator, macerate for 48 hours. Then allow the percolation to proceed, gradually adding menstruum, using the same proportions of alcohol and water as before, until the pudina is exhausted. Reserve the first 850 c.c. of the percolate.

Distill off the alcohol from the remainder by means of a water bath, and evaporate the residue to a soft extract, dissolve this in the reserve portion and add enough menstruum to make the fluid extract measure 1000 c.c.

INJECTION OF QUININE DIHYDROCHLORIDE

Injection of quinine dihydrochloride is a sterile solution of quinine dihydrochloride in water for injection. The content of quinine dihydrochloride is not less than 92.0 per cent. and not more than 105 per cent. of the content of quinine dihydrochloride stated on the label. The solution is sterilised by heat in an autoclave or by filtration.

When injection of quinine dihydrochloride is prescribed, no strength being mentioned, a solution containing 0.3 grm. in 5 c.c. or 5 grains in 75 mins. shall be dispensed. A solution of this strength must be diluted with at least 10 times its volume of injection of sodium chloride before administration and injected slowly.

IODISED SARSAPARILLA

Potassium iodide	1	dr.
Ammonium carbonate	1	„
Spirit Chloroform	2	„
Decoction sarasaparilla co.	5	„
Infusion gentian co.	10	„

Prepare the compound decoction of sarsaparilla in the following manner :—

Take Sarsaparilla cut transversely 2½ oz. sassafras root in chips ¼ oz. guaiacum wood turnings ¼ oz., dried liquorice roots bruised ½ oz., mezereon bark ⅛ oz. and boiling distilled water 20 fl. oz. Digest the solid ingredients in the water for an hour, boil for 10 minutes, cool, strain and make up to 20 fl. oz. Digest the solid ingredients in the water for an hour, boil for 10 minutes cool, strain and make up to 20 fl. oz. Now also prepare a concentrated infusion of

gentian compound according to the direction given :—

Gentian root (bruised) 4½ lbs.; boiling water q.s. to cover it: infuse with occasional agitation for 2 hours, express the liquor, wash the marc with a little boiling water, evaporate to 13 quarts, when cold, strain through flannel, add rectified spirit 1 gallon and pour the mixed fluids on dried orange peel, 9 lbs. Macerate for 1 week, then express the liquor in a powerful press and filter.

LIVER OILS

In the extraction of oils from fish livers or other marine animal tissue by breaking down the tissue by dilute alkali, separating the scums containing the oil, and breaking this emulsion, there is used to break the emulsion a liquid e.g., ethyl alcohol which is miscible with water but not with the oil. For example, 6 cwt. of halibut livers is pulped by live steam, the volume made up to 135 gal. with water, about 5 per cent. relative to livers of scale caustic potash added, and the mixture brought to boiling by steam and allowed to stand for 21 hours; the lower aqueous layer is run off, and the emulsion remaining is warmed by steam and broken by stirring in 5 gal. of industrial alcohol; 5 gal. of water is added to bring the oil to the surface, the aqueous layer run off, an equal volume of saturated brine added to the oil, and the whole boiled, settled, and passed through an oil separator.

LYSOL

Cresol	500	c.c.
Linseed oil	180	grms.
Potassium hydroxide	42	"
Distilled water sufficient to produce	1000	c.c.

Dissolve the potassium hydroxide in 250 c.c. of distilled water, add the linseed oil, and heat on a water-bath, mixing thoroughly: continue to heat until a small portion dissolves in water without separation of oil drops, add the cresol, mix thoroughly, and add sufficient distilled water to produce the required volume.

PTYCHO-SODA TABLET

Sodium bicarbonate	5	lbs.
Oil of thymol	½	oz.

Thoroughly well granulate the soda and incorporate with thymol. The die for the tablet is 5/16th inch and each tablet weighs 5 grains.

RESIN PLASTER

To prepare resin plaster, first prepare litharge plaster according to the following formula :—

Litharge, in very fine powder	6	lbs.
Olive oil	1	gallon.
Water	1	quart.

Boil all the ingredients over a slow fire, constantly stirring to the consistence of a plaster, adding a little boiling water if nearly the whole of that used in the beginning has been consumed before the end of the process.

Now take this litharge plaster and proceed to make resin plaster in the following manner :—

Litharge plaster	72	lbs.
Olive oil	3	"
Pale yellow rosin	12	"

Melt the first two together in a bright and perfectly clean copper pan, and sift in the pale, rosin, stirring all the while. Then allow the mixture to cool. Lastly pull or work in the usual way.

SYRUP OF LEMON JUICE (B.P.)

Sucrose	15 oz.. 87½ gr.
Alcohol (90 p.c.)	a sufficient quantity.

Macerate the lemon peel in 288 minims of the alcohol for 7 days, press, filter, and add sufficient of the alcohol to produce 384 minims , clarify the lemon juice by subsidence of filtration add the sucrose, and dissolve with the aid of gentle heat ; cool, add the alcoholic liquid and mix.

SYRUP OF ROSE (B.P.).

Red-rose petal, dried	1 oz.
Dilute sulphuric acid	130 mins.
Sucrose	a sufficient quantity.
Distilled water, boiling	10 fl. oz.

Infuse the red-rose petal in the distilled water for 2 hours ; strain, press, heat the infusion to boiling, filter, add to the filtrate twice the weight of sucrose, and dissolve with the aid of heat ; cool, replace the water lost by evaporation, add the dilute sulphuric acid, and mix.

RAT POISON

White Arsenic	1	oz.
Tallow	2	„
White Flour	6	„
Prussian Blue	5	gr.
White flour to make upto	1	lb.

Aniseed oil sufficient to give a faint smell to the bait.

Melt the tallow and pour quickly on to the dry ingredients which have been well mixed previously, stirring well until a stiff paste is produced. Then add the oil of aniseed.

SHOEMAKER'S SEWING WAX

Candelilla wax	2	oz.
Rosin	55	„
Burgundy pitch	20	„
Rosin Oil	4	„
Lard	3	„
Heavy mineral oil	1	„

Melt the rosin over slow fire and then mix the other ingredients one by one. Next remove from the fire and allow it to cool.

AUTOMOBILE SOAP

Corn oil, crude	54.7	lbs.
Caustic potash	9.2	„

Dissolve the caustic potash in 30 lbs. water and add it to the oil slowly with stirring. Bring to a boil and then add water to bring to strength desired.

To colour green add 5 grams of alizarine green per 100 lbs. of soap.

STAMPING INK

Aniline dye (spirit soluble)	3	parts.
Glycerin	5	„
Methylated spirit	1	part.

Mix thoroughly in water bath at 100°F to 130°F. Allow to cool. Then bottle.

TRANSFERRING PHOTOS TO GLASS

Where it is desired to transfer photos to glass for display purposes the following process may be easily utilized and with a little practice should give excellent results. The simple, using glycerin, preparation, required can be made up without difficulty.

Glycerin	½	oz.
Gelatin	4	„
Water	8	„
Alcohol	3	„

Dissolve the gelatin in the water with gentle heat, add the glycerin and pour the mixture slowly, with thorough mixing into the alcohol.

Thoroughly cleaned glass and unmounted photos, without printing or writing on the backs, must be used. Flow the solution in the glass and place the photo, face down, on the glass and pour on more of the solution. Excess should be remevod to prevent bubble formation. Allow to dry, the photograph when it is dry will be transparent and may be coloured, if desired with oil paints.

BLACK TYPEWRITER RIBBON INK

Nigrosine	5	parts.
Oleic acid	25	„
Carbon black	15	„
Mineral oil	55	„

Grind thoroughly before applying to ribbon fabrics.

EAU DE COLOGNE

Oil of bergamot	2	dr.
Oil of lemon	1	„
Oil of neroli	20	mins.
Oil of origanum	6	„
Oil of rosemary	20	„
Rect. spirit	20	oz.

Mix in the order given.

GILDING EDGES OF CARDS

Put the cards together so that the edges are perfectly even. Then place in a

press with the edges uppermost. Coat the edges with a mixture of red chalk and water. The gold leaf—perfectly of thin quality—is blown out from the books and spread on a leather cushion, where it is cut to the proper size with a smoothedged knife. A camel hair pencil is dipped into white of egg mixed with water, and with this the partially dry edge is moistened ; the gold is then taken up on a tip-brush and applied to the moistened edge, to which it instantly adheres. When all the four edges have been gilt in this way, and allowed to remain a very few minutes, taken a burnisher formed of a smooth stone (usually blood-stone) and rub the gold quickly till it receives a high degree of polish. For silver edges take a brush, dip it in a saturated solution of gallic acid, and wash the edges, then brush with a solution of 20 parts nitrate of silver to 1,000 parts distilled water. Alternate these solutions until the edges assume a brilliant tint. Then wash with distilled water and dry by free air and heat.

LIQUID GLUE

According to Knafll a very excellent liquid glue is obtained by heating for some 10 to 12 hours upon a water-bath, a mixture of 3 parts of glue in 8 parts of water, to which are added ½ part of hydrochloric acid, and ¾ part of zinc sulphate, the temperature of the mixture being kept below 85° C. This kind of glue keeps for a very long time and is largely used for joining wood, horn, and mother-of-pearl.

MOTOR GREASE

Lime, slaked to powder	100	parts.
Tar oil	300	"
Paraffin oil	800	"
Rosin oil	300	"
Caustic soda lye, strong	12	"

Place the slaked lime and the lye in a pan and stir in the rosin oil until the whole mass becomes white. Gently warm the mixture and stir in the tar oil followed by the paraffin oil, 800 parts of powdered soap stone being finally added. Stir the finished composition until homogeneous.

STAMPING INK FOR IRON ARTICLES

According to R. L. Bhatia, B.Sc. the following is an efficient ink for stamping on safety razor blades and other articles of cutlery made of iron or steel.

Nickel sulphate	5	grams.
Nitric acid, concentrated	6	c.c.
Distilled water	10	"

Mix. This solution could very well replace the so-called "Etching Acid" now imported.

TOMATO KATCHUP

As a result of extensive experiments on tomato katchup, the following recipe has been found to give as good a product as the imported one.

Fully ripe tomatoes are trimmed and green portions, if any, are carefully removed. The sorted and the trimmed tomatoes are thoroughly washed to remove dirt and soft rot. They are crushed raw and then boiled for 3 to 5 minutes in a steam pan at about 40 to 60 lbs. pressure. Prolonged direct heating on fire injures the colour of the product, hence brisk boiling is recommended. The crushed mass, as obtained above, is passed through galvanized iron sieve of mesh 1 mm. (a nickel sieve is preferable) covered with a thin muslin cloth. The liquid, ordinarily termed puree, is then boiled with the required amount of condiments (tied in a cloth bag), sugar, vinegar, and salt, to one-third of its original volume, in a steam pan, the concentration being carefully controlled with a gauge stick placed in the pan. Vinegar is added about 5 minutes before the end of the cooking process, and the salt is added to hot katchup just after the cooking. The cloth bag with the condiments is then removed. The condiments are not added directly to the liquid as their appearance gives it unattractive appearance. The finished product is poured while hot into bottles which previously have been kept in boiling water for half an hour. The bottles are corked, sealed, and pasteurized in boiling water for half an hour and stored in a cool dry place.

PRECIPITATED CHALK

424 N. I. I., Sialkot City—Wishes to have a process of making precipitated chalk.

To prepare precipitated chalk add a strong solution of carbonate of soda to a solution of chloride of calcium (both cold), as long as a precipitate forms. The precipitate is finally washed several times and dried.

CHINESE BLUE

377 V. V., Calcutta—Wants to have a recipe of chinese blue. This is a kind of acid blue and can be prepared thus :—

Sulphate of iron	63	parts.
Yellow prussiate of potash	56	,,
Sulphuric acid (conc.)	30	,,
Bichromate of potash	8	,,

Dissolve the sulphate of iron in 100 gallons of boiling water and also dissolve in a separate vessel the prussiate of potash in an equal quantity of boiling water. Mix the two solutions and boil for 1½ hours. Now pour very slowly the acid and then add the crystals of bichromate of potash. Stir gently for ten minutes, wash at once and repeat washing at least three times, filter, press and dry.

COFFEE TABLETS

415 M. H. B., Badulla—Wants to know a process of making coffee tablets.

Take roasted coffee and grind it to coarse powder by means of a grinding machine. Then mix chicory powder in the proportion of 2 parts of chicory in every 8 parts of coffee or according to the taste of manufacturer. Then put the mixture in an automatic pressing machine and press into tablets. The size and shape of the tablets vary with the manufacturer. Some tablet manufacturers do not add any binding material, but others add about 15 per cent. glucose.

APPLYING DECALCOMANIA PICTURES ON CERAMIC PRODUCTS UNDER A GLAZE.

323 K. M., Salboni—Desires to know the process of applying decalcomania pictures on ceramic products under a glaze.

A biscuit-baked object is first coated with a mixture of alcohol, shellac, varnish, and liquid glue. Then the prepared picture print is transferred on to this adhesive layer in the customary manner. The glaze, however, does not adhere to this coating and would therefore, not cover the picture when fused on. To attain this, the layer bearing the transfer picture, as well as the latter, are simultaneously coated with a dextrin solution of about 10 per cent. When this dextrin coating is dry, the picture is glazed. The mixing proportions of the two solutions employed, as well as of the adhesive and the dextrin solutions vary somewhat according to the physical conditions of the porcelain, its porosity, etc. The following may serve for an example : Dissolve 5 parts of shellac or equivalent gum in 25 parts of spirit and emulsify this liquid with 20 parts of varnish and 8 parts of liquid glue. After drying, the glaze is put on and the ware thus prepared is placed in the grate fire.

The process described is especially adapted for film pictures, i.e., for such as bear the picture on a cohering layer, usually consisting of collodion. It cannot be employed outright for gum pictures, i.e., for such pictures as are composed of different pressed surfaces consisting mainly of gum or similar material. If this process is to be adapted to these pictures as well, the ware, which has been given the biscuit baking, is first provided with a crude glaze coating, whereupon the details of the process are carried out as described above with the exception that there is another glaze coating between the adhesive coat and the biscuit-baked ware. In this case

the article is also immediately placed in the grate fire. It is immaterial which of the two kinds of matachromatypes (transfer pictures) is used, in every case the baking in the muffle, etc., is dropped. The transfer pictures may also be produced in all colours for the grate fire.

DISINFECTING FLUID

179 B. K. P., Calcutta—Wants to have a formula of disinfecting fluid and also a formula of hair oil.

Coal-tar distillate (of sp. gr. exceeding 1,00)	100	parts.
Rosin	85	"
Caustic soda lye (30°Be)	60	"
Vegetable oil	20	"
Water	200	"

Liquefy the rosin by the application of gentle heat. Pour in the vegetable oil (castor oil, til oil, coconut oil, etc.). Now raise the temperature of the mixture to about 100°C and stir in the caustic lye. Boil until saponified. Add water from time to time to make up the loss due to evaporation. Then make the soap solution by adding water little at a time until the whole water has been used up. Allow the solution to cool: when cold add the measured amount of creosote by continual stirring.

DRAWING INK

201 G. T. C., Karachi—Wants to have a formula of preparing drawing ink.

Borax	3	lbs.
Bleached shellac	4	"
Carbon black	2½	"
Distilled water	50	"

Dissolve the borax in the distilled water and then add to it the bleached shellac. Keep aside for a day or until the solution becomes clear. Strain through a fine cloth. Lastly triturate the carbon black in a part of this shellac solution and thin the smooth concentrate with the balance of it. Add some preservative like boric or salicylic acid 1/10 per cent.

ELECTRIC SPARKLERS

597 P. S. B., Jullundur City—Wants a good formula of electric sparklers.

The principal stick consists of wire or thin twisted metal, part of which is covered with a composition containing steel filings.

Fine steel filings	12	parts.
Fine aluminium powder	1	part.
Potassium perchlorate	6	parts.
Water		q.s.

The steel must be protected from corosion with a little paraffin. The gum should be made of the consistence of mucilage. Mix the ingredients thoroughly and add gum solution until a mixture is obtained that will adhere to the wires when they are dipped into it.

This varies in different sections and with different runs of ingredients. In practice, bunches of wires are dipped at once and slowly withdrawn in a current of warm, dry air which causes the mixture to adhere evenly.

A sparkler of great brilliance and which are very effective may be made as follows :

Take

Dextrin	3	lbs.
Water	12	pints.
Potassium perchlorate	10	lbs.
Aluminium powder (fine)	7	"

Take the dextrin and add to same little at a time the whole water stirring continually so as to avoid lumps. Mix intimately the potassium perchlorate with finely powdered aluminium and add this to the gum solution, stirring until a perfectly smooth mixture is obtained. Wire of required size and thickness may now be dipped into it to the desired depth while it is contained in a deep vessel, and placed in a suitable rack for drying. It may be necessary to dip the sticks several times depended on how much composition it is desired to have on them. In this case they should be dried with the composition end up, the first time so that much composition accumulates on the end beyond the stick.

ELECTROPLATING GELATIN & GUTTAPERCHA

415 A. E. W., Amritsar—Wants to learn a process of electroplating gelatin and guttapercha.

In plating articles like gelatine and guttapercha first wash the articles with alcohol to remove all traces of grease and then dip into waterproof varnish. After thoroughly drying apply a second coat with electro-typers' varnish as uniformly as possible. When the varnish has dried tacky fine copper-bronze powder is dusted on every part to be plated. After this treatment, you can proceed with plating in the usual manner.

EMERY WHEEL

231 S. S. S., Lahore—Desires to know a process of making emery grinding wheel.

Emery stones are prepared with emery powder using magnesite as binding medium. The feature of this process is that the pulpy mixture of magnesium chloride solution, magnesite and emery powder is placed in metal moulds, which are mounted on a jig-table, the vibration of which causes the specifically heaviest portion of the mixture, viz., the grains of emery, to settle down gradually to the bottom of the mould as compactly as possible, each grain having time to assume the most suitable position with regard to its neighbours. The process gives an emery-stone consisting of 90 per cent. of emery and only 10 per cent. of magnesite binding medium, the superfluous portions of the latter being forced upward by the pumping movement of the table, and then easily removed.

ENAMELLING OF GOLD & SILVER ARTICLES

366 V. T. R. R., Shivpet—Wishes to have a method of enamelling on gold and silver articles.

Before proceeding to enamelling articles of gold first of all prepare enamels of different colours required for your purposes. The base of all kinds of enamel is glass, coloured in different shades by the addition of metallic oxides and melted with it. A few recipes follow :—

WHITE

Crystal glass, 30 parts; Oxide of tin 6 parts; Borax 6 parts; dioxide of arsenic 2 parts; Powder (consisting of 15 oz. tin per 100 of lead), 100 parts by weight; Carbonate of potassium 40 parts; all by weight. Fuse the whole in a crucible with a small quantity of manganese. Pour it into water and after having pulverised it, melt again 3 or 4 times.

BLUE

Crystal glass, 30 parts; Borax 5 parts; Cobalt oxide 4 parts; Calcined bone 4 parts; Dioxide of arsenic 2 parts; all by weight. Proceed as before.

RED

Pounded flint glass 12 parts; Red lead 16 parts; Borax 3 parts; Flints 4 parts. Fuse in a crucible for hours, then pour it out into water, and reduce it to powder in a mortar.

For applying the enamels, reduce them to fine powder in an agate mortar. During this operation, soak the enamel in water. For dissolving the impurities which may have been formed during the operation, pour immediately a few drops of nitric acid and mix well and then wash to remove the excess.

In the meantime heat strongly the gold articles to be enamelled in order to burn off the impurities and thoroughly cleanse in a solution of nitric acid diluted with boiling water. After rinsing with pure water and wiping with a very clean cloth, it is heated slightly and is then ready to receive the enamel.

Apply the enamels with a steel tool in the form of a spatula the vehicle being water. When the layer of enamel has been applied remove the contained water by means of a fine linen rag pressing slightly on the parts that have received the enamel. Then place it before fire to remove every trace of moisture. Thus prepared put it on a fire-clay slab and introduce in a muffle furnace to fix the enamel.

LIQUID INK ERASERS

349 R. A. & E. W., Kapurthala—Want to have a formula of preparing liquid ink erasers.

Citric acid	1	oz.
Distilled water	10	„
Borax solution, concentrated	2	„

Dissolve the citric acid in the water d add the borax. Apply to the paper th a delicate brush, removing any excess solution with a blotter. A mixture of alic, citric, and tartaric acids, in equal rts, dissolved in just enough water to re a clean solution, acts energetically on ost inks.

RE BRICKS

The raw materials used in the manu-cture of fire bricks are usually too hard be sent direct from the mine to the igmill.

They are crushed or ground before ing made into a paste. It is impossible use crushing rolls, but as fire clays are tained in a rocky rather than in a astic state they are best crushed in an lge-runner mill, and, after sifting, are ixed with water in a pug-mill until a uform paste is obtained of a consistency itable for moulding. It is not advisable mould it immediately but to keep it for veral days—for a month—in a moist ate and then pass it a second time rough the pug mill. The reason for this the souring or putrefaction, which most ays undergo when kept in a moist state, hereby the water is more fully distributed id a more homogeneous paste is the sult. The "soured" or "matured" and -pugged material is then slop-moulded id then the bricks are dried on a hot floor id are afterwards burned as usual.

YE INKLET

Make ready of a butter wicked burner. ver it hold a butter painted pot as dome e.

The burn black will fall over inside pot thin a few minutes. Then take out the t and place umber, co-agulate them until ll mixed together.

Now keep this eye inklet into a small und tin box.

Use : Habitually Indian ladies apply is to their eyes for enhacing beauty.

MILK CURD

928 L. J., Dekova—Wishes to know the process of making milk curd and khoa.

Curd and Dahi may be prepared from milk by fermenting it with lactic acid bacteria called "starter." For this purpose the whole milk is brought to the boil in order to sterilise it and then cooled to body temperature (38°C). During heating a small amount of sugar is mixed with milk, if sweetened curd is desired. When the milk is cooled down to blood heat a small amount of vigorous culture of lactic acid bacteria (starter) is added (5 to 10 per cent of the volume of the milk) and after stirring, the milk is incubated at somewhere near warm place or the vessel in which the milk is held is kept from losing much of its heat by wrapping cloth or hay around it or placing in a pack of straw or hay-box. A good starter will produce lactic acid rapidly by formentation of the lactose. In about 6 to 10 hours the whole of the milk is set into solid curd.

PREPARATION OF KHOA

Khoa can be made only from small volumes of milk at a time. The partially dessicated material from large volumes cannot be controlled easily during the last stage of making. Not more than 2 seers must be used in one vessel at one time, but sometimes one maker can work the milk in two vessels simultaneously side by side. The preparation is laborious, time consuming and requires patience and practice.

The boiling and evaporation is carried out in a small shallow round-bottomed iron pan (karhai or khola) of about a gallon capacity fitted with two small loop handles, and placed over brisk fire (non-smoky wood, charcoal or bright coal). The final pats of khoa must always be as uniform as possible in weight, form and size, and the amount of milk suitable for this purpose is accurately measured out into the pan for each batch. This amounts usually from 1½ to 2 sets.

The milk is poured into the pan and brought to the boil stirring continuously with a stirrer (khunti) with a circular motion and lightly scrapping all parts of the pan with which the milk comes into contact. The milk is made to boil vigorously

ith continuous stirring so as to avoid ırning on the metal surface. To prevent ling over at the start, some agitation by ıuring and raising off the fire may be ıcessary. When the milk becomes visco- ; it is vigorously stirred and moved conti- ıously off the metal surface. In the final ages when the product begins to dry up ıry close attention is necessary and the sidual heat of the iron when the pan is moved from the fire is sufficient. The ıal condition is judged by experience and l particles of milk are collected into a rcular pat. The consistency first is milar to that of butter which strengthens ı further drying to that of dough. The ıt is collected and shaped on the side of ıe pan with the ladle, and then transferred ı a large leaf which serves as the sole pack- g material. The pats are allowed to cool ı floors, and then built up into tiers for ansport into market.

Some makers of khoa add a small piece : alum about the size of a pea at the later ages of evaporation. This causes a more ›rupt coagulation of the protein and gives smoother texture to the product. The ldition of alum is not really necessary and ın be objected to on hygenic grounds, nce it means the addition to a food product : a heavy metal, the physiological action : which is not well known. The practice ıould therefore be discouraged.

RY CELLS

972 M. N. Jansath—Wishes to have process of making dry cell and also photo eveloper.

There are a great number of dry cells ı the market, but as they are all funda- ıentally similar. We shall merely describe ıe construction of one make.

We select, as an example, the Siemen's ry cell which is one of the most satis- ıctory in the market. The positive ement, which acts as the containers, is of ınc either cylindrical or rectangular, ccording to the shape of the shell, and is ›vered by a cardboard casing. The nega- ve element is a carbon rod, surrounded y the depolariser in the form of a stiff ioxide, 42 per cent of graphite, 2 of sal- mmoniac, 1 of gum tragacanth.

The operation is however, performed ın haping the mass in a hollow cylinder by eing forced through a die, so that the arbon rod is easily placed in position. The space between the depolariser and the zinc is filled with the exiter also in the form of a stiff paste consisting of 85 parts by weight of plaster of Paris and 15 parts of flour, moistened with a saturated solution of sal-ammoniac.

The bottom of the zinc vessel is coated on the inside by a thick layer of a bitumin- ous compound on which is laid a disc of thick paper, thus preventing the possibility of internal short circuiting. An annulus of double canvas having a large mesh is placed above the paste, and this in turn is covered with a layer of powdered cork with a piece of paper over it. The zinc container is protected and insulated by a closely fitted cardboard box having a thick base. This case extends higher than zinc, which is entirely hidden by the bituminous seal. Contact is made with the zinc by means of insulated copper wire soldered to it. Two small glass vent tubes are provided for the escape of gases. Contact with carbon is effected by the terminal screw fixed in a vertical holed drilled on the top of the carbon rod. This hole is enlarged at the bottom, and the screw is run in with an alloy of 2 parts of bismuth and one part of tin which expands on solidifying.

PHOTO DEVELOPING FOR BROMIDE PAPER

Distilled water	24	oz.
Anhydrous Sodium Sulphite	4	"
Di-aminophenol hydro-chloride	1¼	"
Cold distilled water to make	32	"

For use add 1 dram of a 10 per cent. solution of potassium bromide to every 8 oz. of developer used.

This developer will not keep. Only enough should be mixed for one day's work.

PAIN BALM

Yellow vaseline	10	parts.
Methyl salicylate	2	"
Oil of cajuput	2	"
Oil of eucalyptus	2	"
Menthol	2	"
Camphor	2	"
Wool fat	20	"

Mix thoroughly in a stone mortar and put in wide mouthed bottles. It may be rubbed gently over the affected parts.

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

A HOTEL IN CALCUTTA

716 J. K. B. Calcutta—What is your opinion as to the prospects of a new hotel in Calcutta, for the boarding and lodging of middle class visitors from the Muffosil ? Do you think such a thing can be run with success in the City ?

Answer :—There is no reason why you should not succeed if you proceed carefully and methodically. About two decades ago, the number of institutions of this class catering for the demands of Muffosilites was particularly limited, and the beginners were free from competition of a damaging kind. Now a days, however, there is a fairly large number of these hotels in different parts of the city, but their number, we are confident, is not sufficiently large to preclude the possibility of few more similar concerns being started and run successfully. We would, however, like to impress on you the urgent necessity of making your rates as low as you possibly can, consistently with cleanliness, good hygine, healthy and substantial edibles and courteous service. If you can do that we are quite confident that you may command a profitable business from the very beginning. The rates of most of the existing residential hotels for Indians are prohibitive, and thus keep away many a customer belonging to the high middle class from seeking board and lodging therein. There are others whose rates are comparatively cheaper, but so disgracefully filthy and frequented by such shady class of customers, that they serve more often than not, to repel, instead of attracting decent people. Moreover these places are very frequently utterly unknown to the muffosilites, who, as a rule, are generally acquainted with the names of those who advertise. To succeed, therefore, as a hotel proprietor you will have to strike a via media between these two extremes. You will have first of all to secure your premises in some central site, or at least in a quarter having easy tram and bus connection with all places of interest. The house should be scrupulously clean and sanitary, and there must be accomodation both for vegetarians and non-vegetarians, with strict arrangements that nothing used in the non-vegetarian department may ever find its way into the vegetarian department. Arrangements should also be kept ready for purdah ladies and for whole families where people could live with as much privacy as possible under the circumstances. The food supplied must be wholesome and well-cooked, without being necessarily rich. As a matter of fact, long term muffosilites having occasion to put up in such a hotel, would prefer plain and wholesome dishes, to rich ones for the simple reason that they would keep down the amount of their bills. The servants and employees of the hotel should be always instructed to treat all the boarders with due respect and consideration, and to carry out their errands, irrespective of the amount of the "tips" they might receive. Provisions should also be made for the supply of bedding to the guests when required for which, of course, extra charges will be made. This will be found to be an additional inducement in not a few instances. And lastly, you must advertise in the pages of the leading monthly magazine, and railway time-tables. You might increase the scope of your advertisements with the expansion of business, but from the very beginning you have to start advertising in the aforesaid quarters if you mean mainly to depend on customers from the muffosil. Another thing which you must do, will be to send your agents (or canvassers) to the Railway Stations regularly every day, to await the arrival of all through trains—for prospective customers.

438 P. B. C., Jabalpur—To make artificial teeth grind felspar and quartz to an impalpable powder, together with a certain amount of kaolin. Then make the mixture into a thick paste with water and tint in a variety of colours by means of titanium dioxide or by the use of salts of cobalt, uranium, manganese, etc. Next press the paste in moulds in which are inserted platinum pins. Then burn the teeth in saggers until well vitrified a temperature of about 48°C being required. They are then covered with an enamel made of the same materials as the body of the teeth but mixed in slightly different proportions. In order to secure a satisfactory match with a patient's natural teeth, the dentist sometimes applies a small additional quantity of glaze of a suitable but to the front of the teeth and refills them in a special muffle.

441 R. C. M., Kankhal—For exporting Indian herbs you may negotiate with the following firms : A. C. Villagean, 82. Beaves Street, New York; Asiatic Trading Co., 235, West 29th Street, New York-1; Iran American Trade Co., 505, Fifth Avenue, New York-17 and William M. Allison & Co., 162, Water Street, New York-7; all of U. S. A.

443 B. R. L., Dacca—Following is a formula of hair dye: Tartaric acid (powder) 3 oz.; barium peroxide 4 oz.; paraphenylene-diamine 2 oz. Mix the above ingredients and keep the mixture in well-corked bottles. This powder is to be made into a thin paste with water and applied to the hair (previously freed from oils with soap and water and dried), by means of a sponge or brush or the fingers. Continue rubbing with it the roots of hair and pass a comb for some time occasionally adding a few drops of hot water to preserve the whole moist. Now conclude by washing with soap and hot water solution.

445 N. M. S., Alipurduar—You may consult Indian Tobacco and Its Preparation published from this office, price Rs. 3/12/- including postage. This book contains process of curing tobacco, processes of manufacturing kimam, zarda, biri, cigars, etc.

446 N. R. A., Salem—Refer your query to the Consul-General for U. S. A., 9, Esplanade Mansion, Government Place East, Calcutta.

448 H. P., Meerut—Pharmaceutical machines and sugar coating machine may be had of Prabartak Commercial Corporation Ltd., 61, Bowbazar Street, Calcutta.

450 B. G. R., Rajahmundry—For weights enquire of Satish Chandra Das & Co., 113, Khengraputty Street and D. Ghosh & Co., 36-37, Khengraputty Street; both of Calcutta. Following is a formula of bindi : Gum arabic 10 oz.; rose water 16 oz.; distilled water 1 quart; cellofas B 5 oz. and croceine scarlet 3 BS 10 oz. Macerate gum arabic and the colours in a stone mortar with sufficient rose water to make into a thin paste. Then put up in phials for use. There is no journal similar to Industry and it is the only one of its kind.

451 S. S. D., Marwar—Following is a formula of boot polish : Beeswax 2½ lbs.; shellac wax 1¼ lbs.; caustic soda lye 4°Be 8 fl. oz.; turpentine oil 8 pints; nigrosine, oil soluble 1½ oz. Shred the waxes and melt them together on a water bath. Add the caustic soda lye and stir until saponification is complete and the mass becomes homogeneous. In the meantime dissolve the nigrosine in turpentine oil warmed to 125°F. in a separate vessel. Now mix thoroughly when the former is still tepid warm. Continue stirring until the temperature falls down somewhat. The mass should be put into suitable boxes when it reaches honey like consistency in cooling down. The above is the formula of preparing black polish. For other shades dispense with nigrosine and use sufficient quantity of the following oil soluble colours such as Sudan brown for brown; waxoline mahogany for dark tan, bismark brown and phosphine scales for ox-blood. We cannot advise you on the chemical used by any man. After

dissolving the film pour in cylindrical mould. You may start shoe making, umbrella manufacture etc. with Rs. 2,000. These are very lucrative business.

452 B. C. P. R., Calcutta—To gild books with letters and figures gum mastic in fine powder is dusted over the surface to be gilded; an iron or brass tool bearing the design upon its face is then heated to a proper temperature, and gently pressed upon a piece of leaf gold, which adheres to it; the two are then transferred to the cover and the tool is generally pressed on it by which means the mastic softens and retains the gold. The loose gold and powdered mastic are then dusted off with a brush. Gold leaf will adhere to leather without the use of mastic but not so firmly as when it is employed. The edges of the leaves of books and paper can be gilded in the following manner. The edges are cut perfectly smooth, and then washed over with a solution of isinglass in weak spirit or with a varnish made of Armenian bole 4 parts and powdered sugarcandy 1 part mixed up to a proper consistence, with strained white of eggs. The coating is allowed to dry, and is then smoothed with a wet rag after which the gold leaf is applied and polished with the burnisher. Silvering book edges may be done in the above manner by taking silver leaf instead of gold leaf.

454 B. C. B., Tikarpara—Ferrous sulphate should be packed in air-tight cans. On oxidation colour of ferrous sulphate will be yellowish. Gallnuts should be powdered and soaked in water for digestion. It will take about seven days, for complete digestion. For preparing ink on large scale you may use wooden barrel. Ink should be kept at least for one month for proper maturity.

455 J. M. L., Bombay—Distil a mixture of tin and mercuric chloride. Grey resin like, solid fusible and volatile will be obtained as distillate.

456 P. S. M., Ramachandrapuram—For homeopathic medicine enquire of Dhar Roy & Co., 8, Netaji Subhas Road; Economic Homeo Pharmacy, 61, Netaji Subhas Road and B. C. Dhar & Bros., Ltd., 81, Netaji Subhas Road; all of Calcutta.

457 C. I., Delhi—To communicate with any querist write him with number and initials care of Industry when your letter will be duly redirected.

459 R. N. C., Jalpaiguri—After preparing the yeast you have to compress it by means of pressure. Following is a formula of yeast: One small tea-cupful of beer, one table-spoonful of sugar and one tea-spoonful of flour are mixed together in a strong bottle, and soundly corked. It is then thoroughly shaken and left in a warm place. It is ready for use when the mixture froths up on shaking generally in 24 hours.

461 I. S. B., Harigaon—Process of manufacturing fire-bricks appears elsewhere in this issue.

462 U. H. T., Coimbatore—Envelope making machines may be had of Oriental Machinery Supplying Agency Ltd.. P12, Mission Row Extension. Calcutta.

463 J. A. P., Cambay—Dyes used in manufacturing boot polish are of different brands signified by numerals. Prospective Industries published from this office contains detailed information about boot polish manufacture.

464 F. I. L. S., Madras—Following is a list of sanitary goods dealers: Arumugam Nagaratnam & Co., 71, Commercial Street, Bangalore; Asiatic Commercial Corpn., 298, Linghi Chetty Street, P. B. No. 1246, Madras-1; B. Sinha & Co., 28, Chandney Chowk Street, Calcutta; Bombay Sanitary Engineering Co. 204, Bazar Gate Street, Bombay; Calcutta Plumbing Stores, 25, College Street, Calcutta; Calcutta Sanitary, 32, College Street, Cacutta; East Bengal Plumbing Stores, 28, College Street, Calcutta; Gopal Chand Puri & Bros., 135, Javeri Bazar, Bombay; J. Champaklal & Co., 44, Nagdevi Cross Lane, Bombay and Kumar Mukherjee & Co., 21, College Street, Calcutta.

465 A. A., Khulna—Process of manufacturing liquid gold appeared in July-August 1953 issue of Industry.

466 G. G. P., Belgaum—There is no arrangement for imparting practical training in tin slate, slate pencil and other manufacture. Formulas will appear in due course.

467G. B., Gorakhpur—For oil crushing machine enquire of Bhartiya Engineering Works, 370, Upper Chitpur Road. Calcutta and Shibpore Eng. & Foundry Works, 120. Harrison Road, Calcutta.

468 M. P. S., Parlakimedi—For cartoons enquire of the following firms: Bengal cardboard Box Factory, 9B, Noormal Lohia Lane; S. Antool & Co. Ltd., 91, Upper Circular Road; Amitava Trading Corporation, 351, Upper Chitpore Road and K. Gupta & Co., 49, Garpar Road; all of Calcutta.

469 M. A. N., Nagpur—Process of manufacturing picture frame will appear in due course.

470 A. F. P., Lucknow—Process of manufacturing iridium pointed gold nibs will appear in due course.

471 V. V. R., Dabbakupalli—Perfumery raw materials may be had of Ghose Bros., 50, Ezra Street; Paradise Perfumery House, 7, Colootola Street; Essence Supply Agency, 6, Colootola Street; Clive Medical Hall, 8, Ezra Street and F. N. Sarkar, 37, Canning Street; all of Calcutta.

472 B. K. R., Navsari—Bleached shellac is prepared in several ways. One method is to boil ordinary shellac in a weak solution of carbonate of potash until it is dissolved then to pass the chloride gas through the solution. When the lac is thrown down free from colour the resin is collected, washed with warm water melted over water and by working with the hands made into the form of more or less twisted cylindrical pieces having a marked fibrous structure. Another method which is to treat the shellac with a weak solution of potash at such a temperature that it is softened and then to work the lac with the hands until it has lost its colour and has acquired the fibrous appearances usual with bleached shellac. It is mainly used in making white varnishes. Its properties are the same as the ordinary shellac; but it gradually deteriorates, becoming very brittle and insoluble in alcohol and in alkaline solutions.

473 K. A. N., Myingyan—For oil extractor enquire of Bartiya Engineering Works, 370, Upper Chitpur Road, Calcutta; Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta and Shibpore Eng. & Foundry Works, 120, Harrison Road, Calcutta.

474 P. K. R. D., Calcutta—Following is a list of slate and slate pencil manufacturers: Bharadwaj Slate Works, Bunglow No. 153, Lalkuti, Agra Cantt.; G. Channaveerappa's Slate Pencil Factory, Tumkur, Mysore; Leela Slate Works, Markapur, Kurnool; Markpur Slate Works, Markapur, Kurnool; Megha Slate Factory, Baramati, Poona; Shree Narmada Slate Works, Markapur, Kurnool; Megha Slate Factory, Baramati, Poona; Shree Narmada Slate Works, Markapur, Kurnool and Steel Slate Mfg. Co., 17, Ajmere Gate, Delhi. Snuff may be had of A. Jainalabedeen Saheb, 113, Mint Street; A. R. Nair & Co., 60, P. B. Road, Vepery; Original Shunmugam Snuff Co., Post Box 140; Shunmugam Snuff Co., P. O. Box 1401 and Rajarajeshwari & Co., Royapuram; all of Madras.

475 P. K. R., Burdwan—Following is a process of marbelizing wood: The first operation is to coat the surface with a white lacquer primer surfaces. When thoroughly dry, prepare a mixture of glycerine thinned 10 p.c. with water. Scatter this mixture on the white lacquered surface with a spray gun that has a spattering nozzle attachment or by some hand process for instance by using a whisk broom. Then use the whisk broom, your finger on a piece of cloth to spread the spattered liquid to the grain effect desired. By various skillful motions and a little care, some wonderful marble patterns can be produced. The next operation is to spray a light coat of any colour (dark green for example) according to the colour effect desired. When this coat has dried thoroughly wipe the surface with a rag saturated with water, this operation will remove the glycerine solution and have a wonderful marble pattern effect. If any other tonings with various colours are desired they should be applied transparently so as not to disturb the marble grain pattern produced. When thoroughly dry a finish coat of clear lacquer can be applied.

476 M. W. P., Chinsurah—We have no book dealing with dipterocarpus oil. The liquid compressant used in the hydraulic brakes of the modern auto consists of equal parts of denatured alcohol and castor oil. The alcohol thins the oil and acts as an antifreeze. The castor oil lubricates the piston and is the fluid through which the pressure is transmitted.

477 R. M. B. R., Burdwan—Following is a list of patent and trade mark agents;

De Penning & De Penning, 10, Govt. Place East; Dutta & Co., 82, Harrison Road; G. C. Roy & Co., Post Box No. 10,405; L. S. Davar & Co., Norton Bldgs., Dalhousie Square; Law Morris & Co., 19, Strand Road; P. Lodge & Co., P. O. Box 6772 and Remfry & Son, Stephen House, Dalhousie Square; all of Calcutta.

478 A. R. T. W., Warangal—We have no book on furniture manufacture and design. You may however enquire of Thacker Spink & Co. Ltd., 3, Esplanade East and W. Newman & Co. Ltd., 3 & 4, Old Court House Street; both of Calcutta.

479 R. K. D., Asansol—Homeopathic medicines may be had of Hahnemann Publishing Co., 165, Bowbazar Street; Dhar Roy & Co., 80, Netaji Subhas Road; Economic Homeo Pharmacy, 61, Netaji Subhas Road; M. Bhattacharyya & Co., 84, Netaji Subhas Road; N. K. Mazumdar & Co., 79, Netaji Subhas Road; Modern Homeo Syndicate, 85, Netaji Subhas Road and Sett, Dey & Co., 40A, Strand Road; all of Calcutta.

480 M. A., Emani—You may negotiate with Plastics Manufacturers Ltd., 105, Stephen House, 5, Dalhousie Square, Calcutta.

481 R. P. V., Banaras—There is nothing known as face beautifier but face cream and face powders are available. Face cream and face powder beautify face. Following is a formula of face powder: Rice starch 30 ozs.; maize starch 20 oz.; kaolin 10 oz.; talc 10 oz.; zinc oxide 20 oz.; calcium carbonate 10 oz.; orange chrome ½ oz.; heliotropin ½ oz.; bergamot oil 1/5 oz.; ylang ylang oil 1/10 oz.; sandalwood oil 10 oz. Mix. Following is a formula of face cream: Stearic acid 180 parts; hard paraffin 20 parts; potassium carbonate 13 parts; glycerine 50 parts; distilled water 750 parts; bergamot oil 2 parts; lavender oil 1 part; ylang ylang oil 1 part; vetivert oil 1 part; geranium oil 3 parts. Dissolve the potassium carbonate in 250 parts of water. Then the remaining quantity of water and into it the glycerine. Next take an [illegible] vessel and put it over water bath. Put into it the stearic acid. When it [illegible]ed slowly pour into it warm solution [illegible]ssium carbonate. Continue stirring [illegible] pour the remaining water, which [illegible] Go on stirring for [illegible] Then remove to congeal. Then mix the essential oils and keep aside for 3 or 4 days after putting a cover over it. Lastly put in phials.

482 P R., Madras—Pearliness of vanishing cream is due to the crystallisation of the stearic acid in the minutest laminae, from which the light is reflected at any angle. It has been also suggested that prolonged beating of a vanishing cream will induce pearly appearance. You may consult Manufacture of Toilet Goods which may be sent to you on receipt of Rs. 4/10/-.

483 N. K., Lucknow—Following is a recipe of smelling salt: Ammonium carbonate 2.2 lbs.; liquor ammonia 1.1 lb.; oil of bergamot 0.56 dr.; oil of lavender 0.9 dr.; oil of nutmeg 0.28 dr.; oil of cloves 0.28 dr.; oil of rose 2.28 dr.; oil of cinnamon 2.28 dr. Mix in a spacious porcelain mortar 2.2 lb. of ammonium carbonate with 1.1 lb. of ammonia, cover the mortar, and let it stand quietly. In the course of a few days the contents will have been converted into normal carbonate of ammonium. The latter is reduced to a coarse powder and perfumed with bergamot oil, lavender oil, nutmeg oil, clove oil rose oil and cinnamon oil. The incorporation of the volatile oils is effected by first triturating about one tenth of the salt with the oils and then gradually incorporating with this perfumed mass the rest of the salt. In this manner a uniform distribution of the odour is effected.

484 G. M. A., Calcutta—In order to remedy moistening of sweet supari in the rainy season you should treat the supari with saccharine.

485 P. C., Narsapur—For pulval write to Globe Nursery College Street Market, Calcutta.

486 S. P. G., Manipur Road—For beedi tobacco enquire of the following firms: Bhailal Bhikhabhai & Co., 99-2, Lower Chitpur Road; Manilal Anandji, 3, Harrison Road and Mooljee Sicka & Co., 51, Ezra Street; all of Calcutta. Tobacco for zarda manufacture may be had of Hajee Latif Abdulla, 123, Lower Chitpur Road and Osman Vira & Co., 24-25, Armenian Street; both of Calcutta. You may consult Indian Tobacco and Its Prep[illegible]

lished from this office, price Rs. 3/12/- including postage. This book contains processes of manufacturing zarda and beedi.

487 C. Z. F., Tuticorin—For paper bobbins enquire of Gogate Paper Box Works, Princess Street, Bombay and James Clendye & Co., 6, Chowringhee Road, Calcutta.

488 P. R. D., Calcutta—Chemicals you require may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane; Butto Kristo Paul & Co. Ltd., 1 & 3 Bonfield Lane and Allied Agency, 16, Bonfield Lane; all of Calcutta. Soap materials may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

489 D. K. O. M., Netrakona—You may use rectified spirit in place of spirit of wine. Rectified spirit may be had of Karim & Co., 78/5, Lyall Street, Dacca; Shafi & Co., Wise Ghat, Dacca and Mir Serajuddin Ahmed, 7, Hyder Buksh Lane, Dacca. For small rotary ghani enquire of Bhartiya Engineering Works, 370, Upper Chitpur Road and Shibpore Eng. & Foundry Works, 126, Harrison Road; both of Calcutta.

490 V. S. S. M., Vellakal—We do not manufacture any machine. For sago making machine enquire of Small Machineries Mfg. Co., 22, R. G. Kar Road and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension; both of Calcutta.

491 T. M. G., Bangalore—After breaking manganese ore in pieces wash with water when mud and other soluble impurities will separate from the ore.

492 P. N. G., Calcutta—Following is a list of bottle merchants : Radha Bazar Bottle Stores, 15, Radha Bazar Lane; P. S. Dutt & Bros., 8, Ezra Street; Satya Charan Paul, 194, Old China Bazar Street; Shree Gopal Bottle Agency, 27, Pollock Street; Essence & Bottle Supply Co. Ltd., 14, Radha Bazar Street and Haridas Dutt & Co., 18, Radha Bazar Lane; all of Calcutta. Chemicals may be had of Allied Agency, 6, Bonfield Lane; Amin Fobal & Co., 29, Colootola Street; Associated Chemical Corporation, 8-A, Bonfield Lane; Calcutta Chemical Co. Ltd., 10, Bonfield Lane; General & Chemical Trading Co., 5, Lucas Lane; Nadia Chemical Works, C44-46, College Street Market and Chempuri Lime Co., 6, Lucas Lane; all of Calcutta.

493 G. K. S., Panchal Dam—Reply to your previous letter appeared in June, 1953 issue of Industry.

495 J. P. C., Bombay—Process of manufacturing papain will be found in Utilisation of Common Products published from this office, price Rs. 3/12/- including postage. We have no book dealing with the property of papain.

496 B. P. P., Junagadh—Advertising tape may be had of Eagle Advertising Tape Factory, 51, Eaglewadi, Kurla, Bombay and India Advertising Tape Factory, 4B, Match Factory Lane and Lakshmi Advertising Tape Factory, 71, & 73, Apollo Street, Fort, all of Bombay.

497 M. M. W., Unchehra—Following is a formula of match stick head composition: Potash chlorate 28 parts; glass powder 5 parts; sulphur 2½ parts; potash bichromate 1 part; manganese dioxide 6 parts; rosin powder ¾ parts; infusorial earth ¾ part; glue 4 parts; water 16 parts. Glue solution is made by keeping the glue under water for 12 hours and melting the same on a water bath. Following is a formula of match surface composition. Red phosphorus 10 parts; antimony trisulphide 5 parts; glass powder ¾ part; potash bichromate ½ part; glue 4 parts; water 16 parts. For trial the chemicals required for head composition may be thoroughly mixed with the solution in a mortar and then the paraffin splint heads are dipped in the same. As for surface composition the chemicals for the same may be mixed with the glue solution in a separate mortar and the sides of match boxes may be painted by means of brush. Detailed information regarding match manufacture may be found in *Safety Matches and Their Manufacture* by K. C. Das Gupta published from this office, price Rs. 5/12/- including postage.

498 S. N. S., Imphal—We have no book dealing with manufacture of paper.

499 E. W. A., Coimbatore—In the formula of tooth powder you add small quantity of peppermint and increase the proportion of camphor. All the ingredients used in tooth powder are non-injurious to teeth.

Export and Import Regulations

IMPORTATION OF PLANTS FROM ABROAD BY AIR

The following Press Note, dated New Delhi, the 13th December 1953, has been issued by the Government of India in the Ministry of Food and Agriculture :—

Importation of plants and planting materials (such as bulbs, tubers, cuttings, roots, leaves, buds, layers, scions, rhizomes, stolons, corms, grafts, vines, slips, etc.) into India by air is strictly prohibited under the Destructive Insects and Pests Act of 1914 and the rules made thereunder by the Government of India.

A number of cases of such import by the public, apparently due to lack of precise information, have come to the notice of Government. The customs authorities at the airports have strict instructions to seize and destroy all such materials coming by air. The entry of even cut flowers or fresh fruits by air is strictly prohibited.

There is no ban on the import of seeds by air; an exception is made in the case of seeds of coffee, cotton, flax, berseem, Mexican jumping beans (Sebastiana-Palmeri), the import of which from any part of the world by air is strictly prohibited. Importation of rubber seeds from America and West Indies is also prohibited, but they may be imported from other countries only after fumigation and disinfection at the port of entry, namely Bombay or Madras, as the case may be. Importation of sun-flower seed from the Argentine or Peru or such seed originating in these two countries is also strictly banned.

In this connection, it may also be stated that transit of plants through India by air is permitted only if they are accompanied by an official certificate of freedom from pests and diseases granted by authorized officers of the Department of Agriculture of the country of origin, and if the plants or planting materials are packed in containers which will not permit insects reading or leaving the plant material and which are not to be opened in any part of India.

EXPORT OF OLD NEWSPAPER TO PAKISTAN AND AFGHANISTAN

The following Trade Notice (No. G-307/53, dated the 8th December 1953) has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

It is hereby notified for information of the trade that export of old newspaper will be licensed freely to both Pakistan and Afghanistan.

2. Licensing will be done on presentation of Shipping Bill/Land Customs Appendix, which should be supported by application in the prescribed form with valid Income Tax Verification Certificate Registration/Exemption Number, as the case may be, and Treasury Receipt for the prescribed amount.

3. Its export to other destinations will continue to be prohibited.

EXPORT OF PAPER, BOARD AND MANUFACTURES THEREOF

The following Trade Notice (No. G-308/53, dated the 9th December 1953) has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

In continuation of this office Notice No. G-211/53, dated the 2nd September 1953 and G-281/53, dated the 30th October 1953, it is hereby notified for information of the trade that export of (*i*) Processed Paper, (*ii*) Straw Boards, Mill Boards and Grey Boards and (*iii*) Paper and Boards (manufactured by Paper Mills) will be licensed freely to all permissible destination up to the end of February 1954.

2. Licensing will be done on presentation of shipping bills accompanied by an application in the prescribed form, quoting therein the current Income-Tax Verification Certificate Registration/Exemption Number, as the case may be, and Treasury Receipt for the prescribed amount. Applicants should clearly mention in their application the variety and varieties of paper intended for export and that the paper desired to be exported by them is of indigenous manufacture.

SUPPLY OF M. S. STANDARD ROUND WASHERS

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SY-1/SR3/RC/3794/IV/1438.

Due by 10 a.m. on the 20th January 1954.

Sealed tenders are invited for—

DESCRIPTION OF STORES

M. S. Standard Round Washers (Black and Galvd.), suitable for bolts of sizes for annual rate contract for supply commencing from 1st May 1954 to 30th April 1955, conforming to D. G. S. & D., Specification No. G. Misc. 86/C.

Price per tender set .. Rs. 7.

SUPPPLY OF BRACKET BEARING PINION SHAFT

Office of Issue :—The Directorate General of Supplies and Disposals (Railway Stores Directorate), Shahjahan Road, New Delhi.

Tender No. SR-1/17315-D/1.

Due by 10 a.m. on the 21st January 1954.

Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Bracket Bearing Pinion Shaft (inner) ..	104 Nos.
2.	Bracket Bearing Pinion Shaft (outer) ..	157 „

Price per tender set Rs. 5-8-0.

SUPPLY OF PUMPING SET, SWITCH BOARD AND CABLES

Office of Issue :—The Directorate General of Supplies and Disposals, Shahjahan Road, New Delhi.

Tender No. SPI/19915-D/111/53.

Due by 10 a.m. on the 18th January 1954.

Sealed tenders are invited for—
1,000 GPM at 900 ft.

Item No.	*Description of Stores.*	*Quantity.*
1.	A. C. Motor-driven Pumping Set capacity 1,000 GPM at 600 ft. head.	3 sets.
2.	A. C. Motor-driven Pumping Set, capacity 1,000 GPM at 900 ft. head.	3 „
3.	H. T. Distribution Switch Board for above	2 „
4.	P. I. L. C. D. W. A. Cables—	
(a)	3 Core by .05 sq. inch 3.3 K. V. grade 2,000 ft.	
(b)	3 Core by .05 sq. inch 550 volts grade 1,500 ft.	

Note:—Electrical apparatus shall be flame-proof and suitable for 2,000 volts, 3 phase, 50 cycles.

Price per tender set .. Rs. 10.

SUPPLY OF PULLEYS, ETC.

Office of Issue :—The Directorate General of Supplies and Disposals (Railway Stores Directorate), Shahjahan Road, New Delhi.

Tender No. SR-3/18358-D/111.

Due by 10 a.m. on the 19th January 1954.

Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Pulleys for diversion complete to part No. 722137 of Central Rly. Drg. No. 72213E (D. G. I. & S. No. 2160/1). ..	1,280 Nos.
2.	Pulleys D. W. S. complete to part No. 722136 ditto.	6,380 „
3.	D. W. Stakes only to C. Rly. Drg. No. 77288 (D. G. S. & D. No. 8520) ..	2,650 „

INDUSTRIAL PRODUCTION

Industries		1952	Jan., to July, 1952	Jan., to July, 1953*	June, 1953*	July, 1953*	July, 1952
Major Industries.							
Coal	lakh tons	362.22	215.3	213.51	29.11	27.53	28.60
Steel	lakh tons	15.78	9.00	8.76	1.15	1.04	1.29
Yarn	million lbs.	1,448.30	814.60	868.70	125.0	133.0	131.9
Cloth	million yds.	4,603.20	2,586.80	2,886.70	418.0	435.0	423.8
Cement	lakh tons	35.37	20.00	21.19	3.19	3.36	3.22
Paper	tons	1,37,504	77,924	79,775	10,603	12,850	11,747
Matches	cases	6,08,200	3,54,500	3,65,800	51.100	52,700	53,200
Sugar	lakh tons	14.19	11.66	10.58	0.02	—	0.05
Engineering and Electric Industries.							
Machine tools	value in lakhs of Rs.	44.37	27.4	25.97	3.64	3.80	3.52
Electric lamps	lakhs	208.61	119.4	117.74	17.72	16.41	17.93
Dry cells	crore Nos.	13.02	7.18	8.04	1.19	1.22	0.95
Transformers	k.v.a.	2,14,800	1,15,100	1,76,800	25,800	27,700	15,300
Motors	h.p.	1,57,600	1,01,200	1,02,700	14,800	14,600	12,600
Electric fans	Nos.	1,95,506	1,31,400	1,27,000	19,300	20,900	18,000
Radio receivers	Nos.	71,495	43,528	34,204	5,729	4,437	7,252
Storage battery	Nos.	1,58,400	1,06,600	98,600	17,000	17,800	11,600
Cables and wires—		5,928	2,138	5.599	733	806	451
Copper conductors	tons	398	254	143	10	10	19
Winding wires	tons	328.6	182.8	287.3	43.0	46.8	24.1
Rubber insulated cables and flexibles	lakh yds.	3,25,000	1,76,000	2,65,700	49,300	38,000	11,500
Insulators—							
H. T.	Nos.	30.50	19.41	9.65	0.48	1.40	2.28
L. T.	lakh Nos.	4,248	2,969	1.184	201	325	321
Chemical Industries.							
Salt	lakh mds.	768.64	654.5	761.91	156.19	43.19	49.86
Caustic soda	tons	17,058	9,291	10,818	1,768	1,711	1,436
Soda ash	tons	44,322	21,449	30,356	4,703	2,544	4,428
Chlorine liquid	tons	6,210	3,402	4,005	521	668	532
Bleaching powder	tons	792	441	938	198	208	34
Bichromates	tons	1,463	841	1,250	139	240	93
Sulphuric acid	tons	96,081	54,058	54,719	7,649	7,975	7,573
Superphosphates	tons	46,650	32,198	19,392	3,175	4,060	4,730
Non—ferrous Metals—							
Aluminium	tons	3,566	2,447	1,955	294	272	366
Antimony	tons	181	132	83	10	38	24
Copper	tons	6,079	3,712	1,882	392	615	490
Lead	tons	1,132	629	853	140	89	60
Miscellaneous (Minor) Industries.							
Sewing machines	Nos.	50,045	29,831	33,883	4,195	5,343	4,081
Hurricane lanterns	lakh Nos.	35.23	20.72	24.08	3.87	3.94	3.56
Bicycles	Nos.	1,96,976	92,186	1,30,189	23,696	25,836	19,648
Cycle tyres and tubes	lakh Nos.	83.55	47.43	52.28	8.34	8.66	8.19
Motor tyres and tubes	lakh Nos.	13.83	8.76	8.16	1.35	1.42	1.20
Cigarettes	crore Nos.	2,058.85	1,217.47	1,161.47	159.72	161.51	152.43
Plywood—							
Tea chests	lakh sq. ft.	782.27	503.02	310.48	35.96	50.00	60.88
Commercial	lakh sq. ft.	122.58	65.83	81.54	8.89	10.00	9.97
Refractories	lakh tons	2.43	1.44	1.32	0.19	0.20	0.22
Abrasives	reams	65,000	21,000	34,100	4,800	4,600	4,000
Sheet glass	lakh sq. ft.	90.42	48.90	117.96	7.54	2.17	—
Woollen manufactures	lakh lbs.	166.68	80.97	93.81	14.75	16.41	16.04
Footwear—							
Western type	lakh pairs	33.67	19.62	19.76	2.50	2.84	2.67
Indigenous type	lakh pairs	18.06	11.76	12.14	1.61	2.04	1.74
Alcohol—							
Industrial	lakh galls.	68.45	41.15	32.78	4.96	4.66	4.40
Power	lakh galls	77.42	49.71	49.25	7.46	6.56	8.30

Figures are subject to revision month to month. * Provisional.

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CONTENTS FOR JANUARY, 1954

Contents for FEBRUARY ISSUE

February issue will contain useful articles on industrial and technical subjects such as Manufacture of Chamois Leather; Fruit and Its Preparations, Dipped Rubber Articles; Decolouring Glass; Development in Cotton Bleaching; etc. in addition to the regular features such as Agricultural Tips; Scientific Researches and Inventions; Engineering Notes; The Business World; Official India; Pharmaceutical Recipes; Recipes for Small Manufacturers; Formulas Processes and Answers; Reader's Business Problems and Queries and Replies.

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THE INDIAN ECONOMY IN 1952-53

The following are extracts from the Report of the Central Board of Directors of the Reserve Bank of India for the year, 1st July 1952 to 30th June 1953 :—

During the greater part of the year under review, the Indian economy displayed a substantial degree of stability. Monetary and fiscal measures taken during 1951-52 had the effect of moderating the inflationary pressures in the economy appreciably by the middle of 1952. This trend was reinforced by the reversal of the inflationary movements abroad, following the adoption of dearer money policies by several countries and the easing of tension in international relations. This disinflationary movement if it had been carried too far, might have produced adverse repercussions on production. There was, therefore, a shift in emphasis in respect of economic policy, which was concerned during the year less with holding inflation in check than with assisting, through various measures, the attainment of higher production.

DISINFLATION IN 1951-52

The disinflationary measures adopted in 1951-52 have been explained in considerable detail in the Annual Report submitted last year and it is sufficient for the present purpose to recount briefly their impact on the economy. The new monetary policy, initiated in November 1951, imposed an effective check on monetary expansion and the pattern of interest rates also moved up. These adjustments curbed speculative lending and enabled the Reserve Bank to exercise an effective control on the magnitude and purpose of bank advances. This disinflationary trend was also assisted by an overall budgetary surplus of Rs. 7 crores, which was achieved despite an increase in development outlay in that year by the Central and State Governments under the first Five Year Plan.

At the same time, the reduction in export earnings, consequent upon a fall in international demand, and the increase in imports made possible by the American Wheat Loan and assistance received under the Colombo Plan, helped to reduce the money supply with the public. Industrial output also rose appreciably and helped to increase the supplies in the domestic market. The general index of wholesale prices (Economic Adviser's index, base; year ended August 1939 - 100) fell from 425 at the beginning of February 1952 to 365 by the middle of March 1952, due largely to a very sharp decline in the prices of industrial raw materials and important export commodities. The nervousness created by this break in commodity prices spread to the bullion and security markets which registered heavy declines. For a while, it appeared as if a severe depression was imminent. But timely measures were taken by Government to bring about a revival of confidence and to arrest the steep fall in prices. Reduction in export duties, especially on hessian and sacking, lifting of quota and destinational restrictions on a variety of exports and declaration of Government's willingness to buy at listed prices cotton held by banks as security against advances were some of the measures taken. The liberal advances granted by the Reserve Bank against Government securities and usance bills helped in the same direction. As a result of all these measures, the general index of prices rose gradually to 381 by the end of June 1952.

PRICE MOVEMENTS IN 1952-53

This movement in prices had, by the beginning of July 1952, allayed to some extent the fears of a severe recession. The continued upward trend in production also helped to restore confidence. The general index of industrial production (base: 1946 - 100) rose from 121.6 in June 1952 to 138.6 in December 1952.

Some doubts regarding the trend of foreign and domestic prices persisted, and in September 1952 prices sagged again as foreign offtake of commodities like jute manufactures, tea and cotton textiles diminished. This trend continued till

December, the general index falling by the middle of that month to 372. But the decline in prices was unevenly distributed, the fall in raw material prices and in prices of export goods being greater than in the case of manufactured articles and food-grains.

After December, however, there was an almost uninterrupted rise in prices, especially in the second quarter of 1953. By early July 1953, the general price index had risen to 407, or 6.6 per cent higher than at the beginning of the accounting year and 2.1 per cent higher than the pre-Korean level (June 24, 1950). A variety of factors contributed to this upswing. Towards the beginning of 1953, commodity markets tended to become bullish on account of expectations of smaller output in the 1952-53 season especially in respect of cotton, groundnuts, black pepper and tea. Stocks of raw materials built up in the first half of 1952 had been drawn upon. There was a further increase in pressure on domestic supplies, due to a steep fall in imports. The export demand for coarse and medium cotton textiles increased and this brought about a rise in the price of indigenous raw cotton.

CAUSES FOR THE RECENT RISE IN PRICES

A factor of some importance which in addition to those already mentioned, accounts for the recent rise in prices appears to be the revival of speculative interest in certain commodities. In the case of foodgrains, though the domestic output for the year as a whole was, in the aggregate, somewhat higher than in the previous year there were certain pockets of scarcity and in certain other areas removal of restrictions on movement of foodgrains led to an increase in price levels.

The rise in prices since December 1952 and, in particular, the increase after April 1953 and the causes underlying it require careful further consideration, for which adequate data are not at present available. This rise has taken place against the background of a declining trend in world prices, and except in the case of tea and possibly raw cotton, there was little external stimulus for the increase in domestic prices. Nor does the rise appear to be due to monetary factors. As explained later in this Report, the expansion of money supply in the busy season of 1952-53 was not abnormal, and as usual there was a return of funds in the first two months of the current slack season.

PRICES AND INDUSTRIAL OUTPUT

A feature to be noted since December 1952 has been the significant rise in those prices, which enter appreciably into the cost structure of manufacturing industries. Prices of industrial raw materials and of food articles have increased supply; in the period, January to June 1953, the index of raw material prices rose by over 12 per cent and the index of food articles by nearly 17 per cent. On the other hand, the price index of semi-manufactures increased by only 6 per cent, while that of manufactured articles actually fell by 0.2 per cent. The index of industrial production, which was on the whole rising in 1952, reached a peak of 138.6 in December, but fell to 130.8 in March 1953. In April, however, the upward movement reasserted itself and the index touched the record level of 141.2. Figures for subsequent months are not yet available. In view of these fluctuations, it is not possible at this stage to draw any definite inferences as to the implications of this increase in prices.

MONEY SUPPLY

During the year, money supply was adjusted to seasonal demands in an orderly manner. Money supply with the public contracted by Rs. 111 crores during the slack season of 1952. Despite the fact that in the preceding busy season money supply had increased by only Rs. 8 crores, this diminution had, as explained below, no untoward effect on the money market. With the onset of the busy season, the increased demand for money was matched by an increase in supply. Between October 25, 1952, and May 8, 1953, covering the busy season, money supply increased by Rs. 87 crores. As in the previous year, the seasonal expansion in money supply was due to an increase in the currency component. Currency with the public rose by Rs. 109 crores, while deposit money fell by Rs. 22 crores. In the same period, there was an expansion of Rs. 78 crores in scheduled bank credit. In the first two months of the current slack season, money supply declined by Rs. 40 crores and at the end of June 1953, it was about Rs. 10 crores less than at the beginning of July 1952.

The reduction in money supply and scheduled bank credit, during the slack reason of 1952, was not such as to lead to monetary stringency. There was a gradual easing of money rates during the entire period. Towards the end of the slack season, the call money rate of the larger scheduled banks came down to ½ – ¾ per cent from around 3 per cent at the beginning of May 1952, and the three months' deposit rate also declined to 2 — 2½ per cent from 3¼ per cent in May. In the 1952-53 busy season, call money rates moved up to the previous busy season's levels of 3 per cent in the case of larger scheduled banks and 3½ per cent for the smaller banks. In general, the movement in interest rates during the busy season was in accordance with anticipations and reflected a smooth adjustment of money supply to demand.

THE GLIT-EDGED MARKET

There were also other indications of the adequacy of money supply during the year. The gilt-edged market remained steady throughout the year, and there was no liquidation of securities by the public in the busy season. The all-India index of Government of India security prices rose by over 1 per cent in the busy season, from 91.1 in September 1952 to 92.3 in April 1953. The State Governments were able in August 1952 to borrow at 4 per cent a gross amount of Rs. 17.1 crores. The cash-cum-conversion issue in June 1953 of the first series of Government of India 3½ per cent National Plan Bonds, 1961, for Rs. 75 crores, were fully subscribed, cash subscriptions amounting to Rs. 23.4 crores, and subscriptions through conversion of the 3 per cent Loan, 1953-55, amounting to Rs. 51.9 crores. Sales of Government of India three months' Treasury Bills to the public were resumed in September 1952, though as the busy season advanced, the weekly issue was lowered from Rs. 2 crores to Rs. 1 crore and the average rate of discount rose in line with other money rates from Rs. 2-0-2 to Rs. 2-7-0.

SHARE AND BULLION MARKETS

Equity and bullion markets, however, tended to be somewhat bearish, and the volume of transactions was substantially lower than in the previous year. In the equities market price variations were largely due to such factors as changes in international situation and the narrowing of the margin between the prices of raw materials and those of manufactured articles. In fact, the reduced volume of transactions, due to a fall in speculative activity on the stock and commodity markets, had itself reduced the pressure of demand for funds.

SURPLUS IN BALANCE OF PAYMENTS

It is expected that during the year July 1952 to June 1953 there would be a surplus on current account in the country's balance of payments, as a result of Government's trade policy. During the second half of 1952, while the trade balance showed a small surplus of Rs. 4.5 crores, the net surplus on current account was Rs. 43.4 crores, as against a deficit of over Rs. 80 crores in the first half of 1952. This has been a factor in easing the money supply position during the busy season. Preliminary estimates for the first quarter of 1952 reveal a continuation of the trend, though the current account surplus at Rs. 17.1 crores is smaller than in the fourth quarter of 1952. These surpluses were due entirely to a steep fall in imports on both private and Government accounts. In view of the unusually high level of imports in the first half of 1952, this fall was, to some extent inevitable. Government imports, especially food imports were much smaller in the latter half of 1952. The falling trend in import prices also contributed to the decline in imports, which in the second half of 1952 at Rs. 298 crores were nearly Rs. 150 crores less than in the first six months of 1953. Private imports fell very much more steeply than Government imports, and it was only in the fourth quarter of 1952, by which time stocks built up in the first half of the year were used up substantially, that private imports revived to some extent. The revival, however, was moderate, and since Government's programme of food imports during the current year was considerably reduced, the balance of payments position was not affected adversely.

Side by side with import payments, export earnings also fell in the second half of 1952 by Rs. 16 crores. The dear money policies followed in several countries in 1951-52, import restrictions imposed by Commonwealth countries, and the stretching out of the defence expenditure by the U. S. A. had the effect of reducing export receipts in the first half of 1952. and the

fall in the succeeding quarters was not therefore marked. In the last quarter of 1952, when the volume of exports declined, receipts did not fall off to the same extent owing to a rise in prices. On balance, therefore, export earnings remained fairly steady though at a lower level than in 1951, but as a result of the decline in import payments, mentioned above, there was actually a surplus on current account in the balance of payments position.

RISE IN STERLING ASSETS

This surplus was utilised partly to repatriate a large part of the short-term funds borrowed from abroad during 1950-52. Even after allowing for these and other private transfers of capital, the sterling balances of the Reserve Bank increased from £ 511 million on June 30, 1952 to £ 536 million on June 30, 1953. There was, therefore, no need for India to draw on the release of £ 35 million available for the period 1952-53.

FINANCING THE FIVE YEAR PLAN

The year under report saw the completion of the second and the beginning of the third year of the Five Year Plan, a revised version of which was published in December 1952. The main features of this revised Plan are now known. Reviewing the progress so far made the Planning Commission published a Report in the middle of May this year, which estimated that development expenditure in the public sector had increased from Rs. 262 crores in 1951-52 to Rs. 322 crores in 1952-53, or a total of Rs. 584 crores in the two-year period. In 1953-54 development outlay is expected to be of the order of Rs. 413 crores. In the remaining two years (1954-56), therefore, development outlay in the public sector will have to be stepped up to an average over Rs. 500 crores per annum, in order to reach the five year target of Rs. 2,069 crores set by the Planning Commission.

As regards the financing of the development programme in the public sector, the Planning Commission has estimated that the Central and State Governments together would be able to raise internal resources amounting to Rs. 1,258 crores in the five year period. In addition, external resources already received by India in the form of loans and grants will help to finance the programme to the extent of Rs. 156 crores. On present estimate therefore, resources available to the public se[ctor] amount altogether to Rs. 1,414 cro[res] leaving a balance of Rs. 655 crores t[o be] covered through further external resou[rces] that may be forthcoming or internal t[axa]tion and borrowing or deficit financing.

EXTENSION OF BANKING FACILITI[ES] AND RURAL FINANCE

Reference was made in last ye[ar's] Report to the recommendations of [the] Rural Banking Enquiry Committee (19[50]) and the Informal Conference on Ru[ral] Finance (1951), regarding the extension [of] banking facilities to rural areas and [the] role of the Reserve Bank in the provis[ion] of agricultural finance. Measures ta[ken] during the year under report to implem[ent] these recommendations included, in [the] sphere of expansion of banking facilit[ies,] further extension of the operations of [the] Reserve Bank to Part B States, opening [of] more branches of the Imperial Bank in re[la]tively under-banked areas and a move [to]wards re-organising the postal savings ba[nk] system on appropriate banking lines. [As] regards agricultural finance, the Ba[nk] agreed to extend its scheme of financ[ial] accommodation to some more State [co-]operative Banks in Part A and Part [B] States. Progress was also made in resp[ect] of the re-organisation of the co-operat[ive] movement in various States.

RESERVE BANK AND PART B STATE[S]

In addition to Madhya Bharat a[nd] Travancore-Cochin mentioned in last yea[r's] Report, two more Part B States, name[ly] Mysore and Hyderabad, concluded agr[ee]ments during the course of the year appoi[nt]ing the Reserve Bank as their sole bank[er.] The agreement took effect on January [1,] 1953, for Mysore, and on April 1, 19[53] for Hyderabad. Subject to certain tran[si]tional arrangements for preventing un[due] dislocation, the Reserve Bank now condu[cts] on behalf of the Governments of Mysore a[nd] Hyderabad their money, remittance, [ex]change and banking transactions, recei[ves] and keeps in deposit their cash balanc[es,] issues their new loans, if any, when the n[eed] arises, grants them ways and me[ans] advances in accordance with the prescri[bed] procedure. To enable the Reserve Bank [to] discharge some of these functions, curre[ncy] chests have been established at selec[ted] centres in these States.

Having regard to the special position occupied by the Hyderabad State Bank in the economy of that State, the Rural Banking Enquiry Committee had suggested that, with federal financial integration, the Hyderabad State Bank should be appointed as the agent of the Reserve Bank in the Hyderabad State. Accordingly, a separate agreement was executed on March 31, 1953 between the Reserve Bank, the Hyderabad State Bank and the Rajpramukh of Hyderabad, empowering the Hyderabad State Bank to transact on behalf of the Reserve Bank, the banking business of the Governments of Hyderabad and the Union of India (including transactions pertaining to railways) within the territories of the State. To enable the Hyderabad State Bank to discharge its agency functions, currency chests and small coin depots have been established by the Reserve Bank at various branches of the State Bank. In consequence, the Hyderabad State Bank will also be in a position to issue and encash remittance under the Reserve Bank's remittance facilities scheme. The State Bank is expected to provide these facilities to the banks and the public in the Hyderabad State with effect from August 1, 1953. In view of the responsibilities which have devolved on the Hyderabad State Bank as a result of these arrangements, the Government of Hyderabad has nominated, in exercise of its powers under the Hyderabad State Bank Act, a representative each of the Union Government and the Reserve Bank to the Board of Directors of the State Bank.

Arrangements are also in hand for the appointment of the Bank of Mysore as the Reserve Bank's agent in the Mysore State as early as possible. With regard to Saurashtra, Rajasthan and PEPSU, certain outstanding issues remain to be settled; and as soon as they are resolved, it is hoped to introduce similar arrangements in these States.

RESERVE BANK AND INDUSTRIAL FINANCE CORPORATIONS

In the field of industrial finance, an amendment was made during the year to the Industrial Finance Corporation Act, 1948, under which the Industrial Finance Corporation of India is authorised to borrow funds from the Reserve Bank against specified types of securities. It also provides for the creation of a Special Reserve Fund, to which dividends on the shares held by the Central Government and the Reserve Bank, will be credited until the amount in the Fund exceeds Rs. 50 lakhs. The Reserve Bank also contributed 20 per cent of the issued share capital of Rs. 1 crore of the Punjab Financial Corporation, set up under the State Financial Corporation Act, 1951, for the purpose of supplying credit to medium and small-scale industries. The State Governments of Bombay, Hyderabad, Travancore-Cochin, Uttar Pradesh, West Bengal, Saurashtra and Mysore are also contemplating the establishment of similar Corporations.

TEA GARDEN FINANCE:

FORMULATION OF LIMITED GUARANTEE SCHEME

The Reserve Bank assisted in the formulation of a scheme for provision of finance to tea gardens, which experienced difficulties during the year. To assess the financial needs of the tea industry and to work out a scheme for provision of bank finance for the 1953-54 season, a Conference was held during December 1952, in which the representatives of the Central Government, the Reserve Bank, scheduled banks, apex co-operative banks and the tea interests concerned participated. As a result of the deliberations of the Conference, the Government of India formulated a limited guarantee scheme, in terms of which Government undertook to meet, to a specified extent, the deficits, if any, of scheduled banks and apex co-operative banks, which agreed to continue to provide normal finance to their tea garden constituents in the 1953-54 season. The guarantee is limited to 20 per cent of the repayments made by the gardens in their hypothecation accounts with banks for the 1952--53 season in the case of gardens situated in Cachar, Darjeeling, Dooars, Terai and Tripura, and 15 per cent of the repayments in the case of gardens situated in other areas. Details of the scheme and the procedure to be followed by banks for availing themselves of the Government guarantee were worked out by Government in consultation with the Reserve Bank. The scheme is being administered by the Chairman, Central Tea Board, Calcutta.

Indian Industries in 1953

Nineteen hundred and fifty-three was a good year for Indian Industry both in the private and the public sectors. The general index for industrial production during the first nine months was the highest for any year since Independence, recording a 38 per cent. increase over 1947 says the STATESMAN.

TEXTILE RECORD

Provisional production figures for the year 1953, compiled on the basis of actual production figures up to October 1953, and reliable estimates for November and December 1953, show that a large number of important industries recorded a rise in production during the year under review.

Cloth production by Indian textile mills during 1953 recorded an increase of 205 million yards over the Five Year Plan target. The production of cement and salt also touched new records during the year while that of steel, coal and jute goods was maintained at almost the same high level as was attained in 1952. A wide range of important engineering, chemical and other non-engineering industries, over sixty in number, registered increases in production.

But it was by no means a year completely free from difficulties from the point of view of industry. While the overall industrial productions, as indicated by the general index, recorded improvement, individual industries some of them very important, had their troubles. Labour trouble affected one of the major producers of steel, while some other industries were affected by a fall in demand, shortage of raw materials, consumer's prejudice against indigenous products, shortage of power and fall in exports.

The Indian cotton textile industry set up a new record of 4,905 million yards of cloth production. This exceeds the Five Year Plan target of 4,700 million yards and is over 307 million yards more than production in 1952. The production of yarn during 1953 totalled 1,511 million lbs. as against 1,449 million lbs. during 1952. Indian textile mills produced 435 million yards of cloth in July, the most ever produced in any one month.

COAL DOWN

Coal raisings during 1953, totalled nearly 36 million tons, being only slightly short of the record of 36.22 million tons set up in 1952. The slight decline is attributed to the pegging of the production of selected "A" and "B" grades of coking coal under orders of the Government of India in pursuance of their policy of conservation of metallurgical coal.

Cement production registered a rise of nearly 200,000 tons during the year, reaching the record level of 3.73 million tons as against 3.53 million tons produced in 1952. The increase was due to the expansion of two existing factories and the setting up of a new one.

A LANDMARK

The production of iron and steel in 1953 would have been maintained at the same high level as in 1952 but for the unfortunate labour trouble in the works of the Indian Iron and Steel Company at Burnpur. Production during the year, it is estimated, will total 1,027,000 tons as against 1,101,000 tons during 1952. But apart from this fall in production of about 74,000 tons on account of labour trouble, the year 1953 is a great landmark in the history of Indian industry as a whole and in the steel industry in particular.

On August 15, 1953, the first step for the setting up of a State-owned steel plant with a capacity of 500,000 tons of steel ingots was taken with the conclusion of the agreement for collaboration between the Government of India and the German combine of Krupps and Demag. The project will enable capacity to be doubled. This agreement has since been supplemented with the signing of a technical consultant's agreement at New Delhi on Dectmber 21, 1953. A company known as Hindustan Steel Limited was incorporated at the same time with an authorised capital of Rs. 100 crores.

It is hoped that the plant, which is expected to cost about Rs. 72 crores, will be completed in four years from the date of the selection of the site. This is expected to be done by the end of January 1954. In the meantime the existing producers are proceeding with their expansion programmes.

The production of salt rose to the record level of 879 lakh maunds as compared to 804 lakh maunds in 1952.

The production of jute manufactures was 85,600 tons less than in 1952 and is estimated to total 866,400 tons. Production during the year 1952 was higher due to the mills working 48 hours a week in the first quarter of that year. The jute industry nevertheless fared much better during 1953. Exports of jute manufactures of all sorts rose to 745,000 tons as against 735,000 tons in 1952. Stocks of jute goods with the mills came down to only 97,800 tons at the end of November 1953, as against 104,200 tons at the end of November 1952. Exports were not so good earlier in the year and stocks had mounted to 138,000 tons in May, 1953, but the position has improved since then.

FEWER CARS

A number of important engineering industries recorded a rise in production as compared with their performance in 1952. There were some engineering industries however, which did not fare so well. The fall in production was sometimes due to a slump in the market, as in the case of radio receivers—the production of which declined from 71,495 in 1952 to 56,880 in 1953—due to deliberate restrictions on some units as in the case of incandescent lamps which declined from 20.88 millions to 19.54 millions. The restrictions were imposed on manufacturers with a capacity of over one million lamps per annum because excessive stocks were held by some of the smaller manufacturers.

The production of motor cars was affected by closure of two manufacturing units due to labour trouble. The number of trucks assembled went up to 9,087 as against 8,339 in 1952 but the number of cars assembled declined to 5,059 from 6,952.

MISCELLANEOUS

The production of refractories declined, due to a shortage of steam coal and transport difficulties, from 243,602 tons in 1952 to 206,947 tons. Another industry affected partly by transport difficulties and partly by shortage of raw materials was asbestos cement sheets which declined from 87,706 tons to 74,382 tons.

Aluminium production was 3,380 tons as against 3,566 tons in the previous year, the output of one of the units being hampered by a power cut for five months.

The production of important chemical and other non-engineering industries recorded a rise in 1953.

The production of plywood tea chests was 47.42 million sq. ft. as against 78.22 million sq. ft. in the previous year, while that of plywood commercial was 10.65 million sq. ft. as against 12.25 million sq. ft. in 1952. The main reason for this steep fall was lack of orders for tea chests with the plywood factories due to the slump in the Indian tea industry which

commenced in the middle of 1952. The full effects of the slump were felt by the plywood industry in 1953 when 30 per cent. of the factories went out of production and the rest curtailed their production.

The production of paint declined from 32,173 tons in 1952 to 29,616 tons in 1953: this was due to lack of demand. Exports are being allowed to create demand and stimulate production. The production of matches also had a setback in 1953 being 598,225 cases (containing 50 gross each) as against 608,113 cases in the previous year.

The production of plastics declined by over 255,000 gross to 1.28 million gross due to a shortage of power in the Bombay-Poona area. Production is expected to increase as efforts are being made to restore the power cut.

The Sindri Fertiliser Factory produced 265,602 tons of ammonium sulphate during the year as against 172,519 tons in 1952. Good progress was made in the construction of a battery of coke ovens which are now expected to go into production in July, 1954.

At the Hindustan Shipyard Limited, at Vishakhapatnam, two cargo ships of 8,000 dwt. each were launched and are now in the process of being fitted out. They are expected to be completed towards the end of March and June, 1954, respectively. In addition, keels of three cargo ships of 7,000 dwt. each of Maierform design and using diesel oil were laid during the year.

The shipyard has also started on the programme of development. The completion of the first stage, which is estimated to cost about Rs. 180 lakhs, will raise the output of the shipyard from about 2½ vessels per year of 8,000 dwt. each to about six vessels of the same size per year. This increase in production will be brought about by increase in the number of berths, installation of more cranes and machines and erection of a prefabricated bay. A third slipway was commissioned in August, 1953. Work is in progress on the construction of two more slipways (berths) and on extension of the machine shop and the blacksmith shop.

power and fall in exports.

Modern Process of Canning

A GENERAL DISCUSSION

Canning is one of the most widely used means of preserving the perishable fruits and vegetables. Until within comparatively recent years canning in the home or in a small way was restricted to fruits and tomatoes. If non-acid vegetables were canned a preservative consisting of some harmless acid was added to the vegetable, to insure its preservation. During the past quarter century, however, *canning in the home has been steadily* increasing due to the adoption of methods which to-day enable the small operator or the home canner to preserve successfully all kinds of fruits, vegetables, meats, poultry, and sea foods. The thousands of packages of these various foods canned in the homes throughout the country attest to the reliability of present-day methods.

There are many reasons why canning should be a profitable enterprise in the home or small farm factory. Some of the formost of these reasons are:—

1. Food materials are saved that would otherwise be lost.
2. Canning provides the home with a large supply of foods which allow greater variety in the diet, thereby giving better-nourished bodies.
3. An immense amount of labour is saved in the preparation of meals if an adequate supply of canned foods is available.
4. Canning the surplus, or the purchase of raw materials when they are cheap and canning them, will result in considerable saving in the item of table expense.
5. Canning operated as a business, offers almost unlimited opportunities for growth and development.

The most successful canner is the one who knows or seeks to know the "why" of every operation in the business. To know "how" is to be merely an artisan, but to know both "how" and "why" is to be an artist and a scientist.

CANNING DEFINED.—Canning has been defined as the preservation of foods in hermetically sealed containers, the preservation *being accomplished by the means* of heat.

FUNCTIONS OF HEAT.—Heat as applied to the canning of food performs three distinct functions:—

(1) It cooks the raw materials making them more nutritious and palatable.

(2) It destroys or renders inactive all organisms and enzymes in contact with the food.

(3) As a general rule the heat is relied upon to develop some degree of vacuum within the container, making possible a reliable hermetic seal.

METHODS OF CANNING

The method of applying the heat and the time during the canning operation at which it is applied give us two distinct methods of canning: (1) open kettle canning, (2) can-cooked canning.

OPEN KETTLE CANNING

When foods are canned by the open kettle method the procedure is essentially as follows:—The prepared materials are placed in a suitable sized cooking vessel and sufficient liquid, water, fruit juice or sugar syrup is added to prevent scorching and to facilitate cooking. The kettle is

then set on the fire and brought to the boiling point. When the materials are thoroughly heated, that is, when they boil steadily while being gently stirred, they are quickly transferred to containers which together with their covers have just previously been boiled for several minutes and which are still hot. The containers are filled and the covers are applied at once, thereby sealing the hot foods air tight. The containers are then set aside to cool before storing.

The shrinkage of foods during cooling develops the necessary vacuum to maintain the seal and to prevent further enzyme action. This method of canning is restricted to acid foods, that is, all the fruits and such vegetables as tomatoes and rhubarb, although foods such as pickles, relishes, etc., to which have been added a liberal amount of vinegar may also be canned in this way.

There are some decided objections to this method and it is therefore rapidly falling into disuse. Soft fruits like the berries are very likely to break up, giving a rather unattractive appearance. Aromatic fruit loses much of its flavour and consequently its quality is lowered. Firm fibrous fruits like the pear and peach, if not over ripe, may be canned very successfully, and tomatoes and rhubarb are canned equally as well by this method as by any other. But because it is so restricted in its application and because many fruits are injured in appearance or quality or both, the method is not to be recommended for the general canning of fruits. This method is frequently resorted to when canning manufactured fruit products such as butters, conserves, jams, and marmalades. However, as a rule the can-cooked method is more satisfactory with these products.

CAN-COOKED CANNING

In the can-cooked method the materials, properly *prepared, are packed into* the containers in a raw, partially cooked or wholly cooked condition after which they are subjected to a heating or processing period in the sealed or partially sealed containers. This is the method practised by Appert, the discoverer of canning, and is the method in general use throughout all commercial canning factories. It is also the method that is superseding the open kettle method of canning in the home. Foods canned by this method retain their shape better, there is less loss of aroma, the quality is of the best and all foods may be canned with perfect safety.

METHOD OF APPLYING THE HEAT.—There are four general methods of applying the heat to the foods after they have been packed into the containers. (a) the one period method (b) the intermittent or fractional method, (c) the steam pressure method, (c) the pasteurization method.

(a) THE ONE-PERIOD METHOD.—By this method the sealed or partially sealed packages of food are subjected to a single period of heating in either steam or hot water at a temperature of boiling water. The length of the period is determined by the nature of the food, the solidity of the pack and the size of the container.

This is the method used most generally throughout the Northern and Eastern states and is the one most commonly recommended for home and small factory canning, in that section, provided the elevation is less than 1000 feet above sea level.

Its chief advantage lies in its simplicity and in its economy of time, energy, and fuel; and where strict regard is had for every detail in the preparation of materials and in filling the containers general satisfaction is the result. Scientists, however, are not yet ready to advise using this method for canning meats and such vegetables as corn and peas. Their objections are based upon the fact that there is a possibility of these products containing organisms which can withstand boiling

temperatures for a longer period than are used for processing these products. Should the organisms be present the foods are likely to spoil. There is unquestionably less risk of such foods can be processed by steam pressure. However, just as long as canners continue to be successful with the one-period processing just so long will it be the method employed by small canner.

(b) THE FRACTIONAL OR INTERMITTENT METHOD.—This is the method that is in more general use for non-acid foods throughout the South where climatic conditions present more difficult problems to the canner than are found in colder section. The method is applied only to meats and the more difficult vegetables and is essentially as follow:—The prepared foods are packed into the containers as in the one period processing and are then subjected to a relatively short processing at temperature of boiling water on each of three succeeding days. The length of each processing may vary somewhat with different materials, ranging from sixty to ninety minutes.

This method is based upon sound scientific principles. It is taken from what was formerly the common laboratory method of sterilization. By subjecting his cultures or media of this method of processing if proper precautions were taken between cooking periods the laboratory worker could be sure that his materials were sterile, that is, all micro-organisms had been destroyed. This method is based upon the well-recognized principles that (1) active or vegetative bacteria are destroyed by a few minutes of boiling temperature and (2) spore forms of bacteria develop rapidly into active forms under the influence of heat. Hence the method works as follows:—The first processing period if sufficiently prolonged will destroy all active forms of bacteria. During the interval between the first and second processing all or practically all the spores will develop into active forms. These will be destroyed during the second processing. Another processing is given the day following in order to destroy any late developing spores which were not active forms at the time of the scond processing. This method, if properly applied, will practically insure sterile packages.

The most serious objection to the general use of this method of processing is that it is too expensive in time, energy, and fuel besides being of considerable trouble where much canning is being done. In fact as the amount of canning increases, the difficulties in applying this method become so great as to render it practically impossible

In those sections of the country where the one-period processing has proven satisfactory there is no occasion to use the intermittent method unless one has had trouble in keeping vegetables or meats when the one period processing was used. Under such conditions one should resort to this method if the steam pressure cooker is not available. In those sections where the one-period processing is known to be unsafe the steam-pressure method is recommended as more economical than the intermitrent method and equally safe.

Jars which are self-sealing by means of a soft composition are not suitable for use if this method of processing is used.

(c) THE STEAM-PRESSURE METHOD.—This is the method which is used almost altogether in commercial canning of most vegetables, meats, and sea foods and it is also rapidly being introduced into the home and factories.

The period foods are packed into the containers as described in the above two methods, the containers are then placed in a steam retort where through pressure the processing temperature can be raised far above that of boiling water. There are no known bacteria that can endure a tem-

ed, causing serious losses of canned foods. The canner should therefore adopt some practice whereby the amount of solid contents is fairly uniform, of sufficient amount to insure a full, attractive pack yet not so tightly packed as to require extra long processing in order to insure preservation.

TEMPERATURE OF THE PROCESS.—The final determining factor is the temperature within the processor. Under normal conditions of atmospheric pressure at or near sea level the boiling point of water is 212°F. A food which would normally be processed at boiling temperature, or 212°F., for two hours would be preserved if processed for 35 minutes under 10 pounds steam pressure at a temperature of 240°F.

The temperature of boiling water falls approximately 1°F. for each 500 to 600 ft of elevation above sea level. It must thus be that processing in the water bath becomes more difficult as the elevation above sea level increases. Fruits may be safely processed at elevation of 1000 feet or more by lengthening the processing period. It is extremely doubtful if vegetables, meats, and poultry should ever be processed in the water bath at elevations exceeding 1000 feet. Under these conditions the canner should make use of the steam pressure processer for all foods except fruits and tomatoes.

INITIAL TEMPERATURE OF PROCESSOR.—This applies primarily only to fruits. The temperature of the water bath should be 150° to 180 F. at the time the packed containers are placed in it. The length of the processing period for most fruits bears a close relation to the initial temperature of the water bath.

SOME PROBLEMS IN CANNING

Both the canner and teacher are called upon to explain why a great many things are as they are in canned foods. A few notes on some of the more common problems may restore the confidence of the canner and also help the less experienced teacher over some difficult places.

WHY FRUITS FLOAT IN THE JAR.—This is a very common occurrence and is explained as follows.—(a) Character of the fruit. Some fruits are soft, tender or juicy. When heated their internal structure breaks down the fruit collapses and as a result tends to float toward the top of the jar. Examples are strawberries, soft juicy plums. (b) Improper packing. If jars are not properly packed, that is, if not enough fruit is packed into the jar, the tendency always is for loosely packed fruit to float in the syrup. This is a natural result since the specific gravity of fruit is less even than water. (c) Over-processing. Fruits that are much over-processed become soft and float for the same reasons as given under (a). (d) Syrup too heavy. If the syrup is too heavy it will cause a shrivelling of the fruit and a consequent floating. Canning syrups should be adapted to the acidity of the fruit, and rarely will one require heavier than 50 or 60 per cent sugar.

LACK OF LIQUID IN THE JARS.—This is one of the most common troubles when canning in glass jars. Furthermore it occurs in canning almost all foods where a free liquid is a part of the jar's content.

Some of the most common causes are:

IMPROPER PACKING. — If the materials are packed too tightly in the neck of the jar the gases and steam do not escape readily, consequently pressure is set up within the jar. When the pressure becomes sufficiently great to force an opening through the tightly packed neck a portion of the liquid content is carried out with the escaping gases and steam.

AIR POCKETS LEFT IN THE JAR.—When the liquid is poured in over the solids, large pockets of air likely to be im-

prisoned among the pieces of solids. These escape during processing and the liquor level sinks because these spaces are now filled with liquid. This difficulty may be overcome by: (a) using hot liquids. The heat expands the air and it bubbles out. After standing a few minutes, more liquid is added to give proper fill. (b) Agitation of the jar after pouring in the liquid will generally cause the air to become dislodged. The jar may be grasped around the neck and rotated quickly to right and back again for a few times, or (c) a thin flexible spatula may be run down the side of the jar and by pressing outward on the handle the blade will press inward upsetting the equilibrium of any air bubbles.

INSUFFICIENT BLANCHING. — In some cases, for example, string beans, asparagus, sliced apples, etc., blanching is primarily given for the purpose of expelling included gases. If this is not done the gases are expelled during processing. Then after removal of jars from the processer much of the liquid is absorbed by the solids leaving the free liquor at a low level in the jar. In blanching and cooling such products the operator should endeavour to leave materials in the blanching water as long as safety will permit and in cooling they should be left in the cold water long enough to insure absorption of water to fill spaces formerly occupied by the gases. Well blanched and properly cooled materials of this character will sink in cold water rather than float on it.

JAR TOO TIGHTLY SEALED. — In all common types of jars used in home canning, provision is made for the jar to be only partially sealed during processing. The method of providing for this is discussed. Containers and Their Manipulation. Pressure is necessary to lift the cover sufficiently to allow for escape of gases; but if considerable pressure is necessary to lift the cover the pressure is uniformly distributed throughout the jar and when it becomes sufficiently great to lift the cover the outrushing gases carry some of the liquids with them. The same principle applies here as in the bottle of soda water. When cover is suddenly removed both gas and liquid flow out of the bottle.

IMPROPER MANIPULATION OF THE PROCESSER.—When processing in the water bath it is very desirable that the tops of the jars shall be covered with water throughout the processing period: or, failing in this, the processer should be equipped with a cover which should be taken off just before the fire is removed from under the processer.

When processing under steam pressure the pressure should be maintained fairly uniform throughout the processing period. The pet cock must not be opened until the pressure inside the processer has fallen to zero.

When processing is taking place in the steamer the doors of the steamer must be opened before the fire is removed. Otherwise a vacuum may form within the steamer causing the liquid to flow out from the jars. This same condition is likely to obtain in the case of the covered water bath if the water does not cover the tops of the jars. Because under these conditions the water bath actually becomes a steamer and should be manipulated as such.

SPOILING OF CANNED FOODS.—As a general rule the spoiling of canned foods may be attributed to one of the following causes:—

IMPERFECT CONTAINERS. — There are many ways in which a container may be imperfect. But if because of cracks, bubble holes, imperfectly fitting covers, the jar does not seal air-tight after processing, the food is sure to spoil. Careful inspection of jars before packing will eliminate a large amount of this trouble.

POOR SEALING MEDIUM. — If the rubber ring or other sealing medium is not

in good condition the jars will not seal and spoilage is sure. Rubber rings should be thoroughly tested and if a composition material is used instead of a rubber it should be examined carefully. It should be fairly soft and should be continuous around the edge of the cover. If hard and brittle or if there are broken places, these covers should be discarded. Jars must be sealed *air-tight if food is to keep.*

OVER-PACKED JARS. — All processing *periods* are based on moderately packed containers. If those *materials* which tend *to form a tight pack with little or no free* liquid present are over-packed a normal processing period is insufficient to preserve them. The canner would better err on the side of under-packing and have spoiled foods.

UNDER-PROCESSING. — There are so many ways in which the home canner may under-process and still feel sure that the proper time has been given, for example, begin counting time too soon, temperature below proper degree for a part of the period, water allowed to boil off exposing tops of jars, slightly over-packing, water boiling below 212 F., etc. Too much emphasis cannot be placed upon care in processing. The canner would far better extend the period of vegetables, meats and poultry beyond the normal period than to make any reduction

IMPROPER MANIPULATION OF MATERIALS.—Much of the flat sour troubles no doubt arise from allowing materials to stand around too long before processing. The bacteria which are responsible for this troubles thrive best at temperatures of 100° to 150°F. Prepared materials then should be kept cool until they can be processed. If prepared materials are packed and covered with hot liquid, they should go into the processer within the hour. Green vegetables should not be packed into bags or *baskets* and allowed to heat before canning. This is one prolific source of poor quality canned vegetables

STORAGE. — Canned foods should be stored in a cool place. Warm storage hastens deterioration and spoilage.

DISCOLOURING OF FRUIT.—Sometimes the fruit in the top of the jar turns brown or black after the jar has stood for some time. This is due to enzyme activity and indicates under-processing. Either the processing period was not long enough to exhaust the air properly or the temperature of the fruit was not sufficiently high to render the enzymes inactive. This trouble is most likely to occur with large fruits such as pears, plums, and peaches. The remedy is an increase of a few minutes—5 to 10—in the processing period.

Manufacture and Uses of Micanite

In the manufacture of Micanite, the Mica is first split into thin laminae or films (Mica Splittings), — which are then assembled and struck together by means of heat and pressure with an insulating binder. This product is called built-up Mica or Micanite and can be made to any required size and thickness. When heated, it can be bent into any desired form which is not possible with Natural Mica. In a normal Mica mine usually a large-proportion of "Blocks" or "Books" are available,—the larger sizes of usable Mica not being in sufficient abundance. In the early days of the Electrical Industry, all the sides of Commutator segments were cut out of crystal Mica Sheets, but with the rapid increase of demands prices of large size Mica Sheets rose upto uneconomic and prohibitive limits making it imperative to devise means of utilising cheaper and smaller sheets of Mica for these purposes. Thus the method of sticking together splittings, split out of different small size Mica, Blocks came into use — so that any large size, thickness and shape of Micanite Sheets may be artificially manufactured at economic cost. This invention of Micanite manufacturing process and its commercial utilisation was a very significant acquisition of far reaching importance in the advancement of the Electrical Science and Engineering, but for which, the steadily progressive development of the Electrical Industry would have been seriously handicapped, for insufficiency and costliness of the available production of Sheet Mica, for meeting the huge demands of the Industry. Every year thousands of tons Mica Splittings are being Consumed for elertric purposes.

THE PROCESS OF MICANITE MANUFACTURE

Micanite is made up by laying on a table (without paper) or on a clean thin sheet of paper an overlapping layer of Mica Splittings in a manner so as to leave no space between. These Splittings should be onethousandth of an inch (i.e. .001" or 1 Mil) in the thickness or still thinner. These are then brushed over with strong insulating varnish (ordinarily shellac is used in case of Hard micanite and oil copal varnish is used in case of Flexible Micanite). The latest improved insulating binder is Glyptal, discovered and patented by the General Electric Company.

Another overlapping layer of Mica Splittings is then placed on the varnished surfaces while the latter is still wet, in such a manner that the joints in the lower layers are covered up by the whole pieces and the process is repeated, until a plate of the desired thickness is obtained. In order to drive off the volatile solvents used in the preparation of varnishes, the freshly made Micanite plates are placed on a steam-heated table or a hydraulic Press for a definite period and the Boards are baked under pressure and machined into required dimensions and thicknesses. This period depends on the purpose for which the Micanite is to be used. The quality of the Mica Boards will vary according to temperature, pressure and binder, employed at this stage and in course of the processes of manufacture. If a Hard Sheet is to be made, the Micanite Sheets are to be placed on a Hydraulic Press for a just sufficient time to soften and compress the material and while still being subjected to pressure, is cooled by circulating water through the plates of the Press. The percentage of bond in the finished Micanite Plates usually varies from about 10 per cent. in the Moulding Micanite to

about 1 per cent. in the commutator segment Micanite.

The varnish or binding material is almost entirely passed out of the Micanite during this process in case of compressed Micanite so that the finished product may not contain more than 1 to 2 per cent. of the binder. For common insulating purposes, Built-up Mica in some respects, is as good as the Natural Mica and superior to it from consideration of more convenient adaptibility to any desired shape, to suit different special requirements. Micanite Sheets are principally consumed in the manufacture of Commutator segments and in various forms of Dynamos, Motors and Transformers etc.

Descriptions and Uses of some of the more marketable Micanite products are given below:—

1. Flexible Micanite: Made up with non-drying varnish by sticking together as thin films as possible.

Size:—It is Different according to different Manufacturers or specifications of different users. The common sizes are 18" × 36", 36" × 36", 22" × 42", 42" × 36" and 40" × 40" etc. or in millimeters of 1000 × 1000 mm.

Thickness — The common ones are .004", .005", .006", .008", .012", .016", .020", .024" .028", .032", .036", .040" .050", .060", .080" etc.

Use:—It is intended for use in works requiring high class flexible insulation including Armatures, Transformer etc.

2. Mica Plates or Micanite products are made by synthetic binders, specially prepared by different Insulation Specialists. Shellac is the common binding ingredient and the latest advanced type of bond for this purpose is a glycerine resin called "Glyptal" (patented by Messrs. L. E. Barringer and C. F. Peterson in U. S. A. in 1926). The Glyptal-made Micanite possesses more than double the surface resistivity, dielectric strength, transverse strength and transparency &c.—than the shellac-made stuff. Moreover, the former is nonconducting, slightly affected by heat and moisture and does not attack copper whereas the latter is conducting copper-attacking and markedly affected by heat.

Insulating Oil and Varnish: The varnish used for Flexible Micanite is not suitable for Commutator or Hard-moulding Micanite and the larger Insluation Materials Manufacturers use varnishes specially prepared by themselves.

Synthetic Resin is fast replacing the use of Shellac as a Micanite bond, as the Resin-made products are transparent and colourless like the Splittings itself, without the characteristic brown colour of the Shellac-bound Micanites. On account of transparency of these Plates, inclusions of foreign matter may be easily detected. Thus Resin-made Micanites may be rendered free of objections seriously affecting the electrical resistivity of the Plates.

The manufacture of Micanite and Mica products such as Wall-Paper, Roofing Materials, Dellite, Bakelite, Radiolite &c, is yet a close line.—everyone concerned being reluctant to facilitate enquiry and afraid of divulging the "trade secrets." A good deal of secrecy thus surrounds the manufacture of Micanite varnishes and one jealously guards the knowledge of his own preparations from others.

Insulation Shellac Varnish:—This may be made for ordinary use by Orange Shellac, dissolved in Methylated spirits. Highly insulating varnishes for use in different lines of Micanite products, can be made with the help of chemists and specialists.

Synthetic Resin Varnish:—The preparation of this is also a close secret and different firms make it differently.

Flexible Micanite has a minimum quantity of binding materials and retains flexibility at all temperatures. It is generally used in cylindrical parts or bars,—in which Brown plates are unsuitable.

Punctured Voltage—600 per mil.

Heat Resisting Micanite. (Also called Heater Micaplate).

Size.—Special requirements made to order, and buyer's specifications. The usual ones are—18" × 36", 23" × 40", 22" × 42" etc.

Thickness—.008", .010", .012", .015", .016", .020", .025" etc.

The thickness of a Heater plate should not generally be under .010".

Use—This is used for the special purpose of obtaining resistance to heat and is ordinarily efficient to withstand temperatures upto 1000°F. to 1500°F. and in the use at this temperature, it is safe for electric currents upto 250 Voltages. This is also used for winding the elements in hot Irontoasters etc.

Breakdown strength is 250 Voltages per mil.

Puncture Voltage, 950, and 1000 to 1500 volts per mil.

3. The Moulding or Hard Brown Micanite.

Usual size—18" × 26", 20" × 40", 42" × 22½" or 1070 × 570 mm. etc. Special sizes are made to order.

* Thickness—.008", .010", .012", .015", .020", 025", .032", .040" and over.

Use—This is used for moulding into Strongs, square tubes, Commutator Rings, Stampings, Washers of all descriptions etc.

Note—Moulding Micanite when subjected to 2000°F. to 2500°F. (or 1200°C.) becomes soft and flexible and can readily be moulded into any desired shape—which it permanently retains on cooling. Its particular uses are in commutator Rings, slip Rings, Tubes, Washers, Troughs Transformer Insulation etc.—but it should not be used for Commutator segments.

Average breakdown strength is 900 to 1010 volts per mil.

4. Micanite Paper:—Made up by sticking up together very thin soft flakes in several layers, covered on each side with Japanese Papers.

Size: — 36" × 76" or 1000 × 1000 mm. special to order.

Thickness—.005", .007", .008", 010", .012" etc. (minimum 0.1 mm.).

Use—In wrapping up Round Copper stator bars in Alternators and suitable for moulding pieces, Tubes, channels etc. without heating.

Average breakdown strength is 465 volts per mil.

5. Micanite Cloth: — (Or Micanite Linen). Made as above, using cloth or linen instead of paper. 2 to 3 layers of Mica Splittings with cloth or linen on either side or both sides, the former being the standard. The bond used should be an elastic adhesive Varnish — always innocent of attacking copper.

Size:—40" × 20" or 36" or 1000 × 1000 mm.

Special Size to order.

Macallen's standard is 16 ft. × 32 inches shipped in rolls.

Thickness—.008", .010", .015", .020", .030", .040" and over.

Average breakdown strength—300 to 450 volts per mil.

6. Mica Folium:—Composed of Splittings backed with a layer of specially prepared paper. This is said to have first been introduced for practical purposes by Dr. Haefely of Bale.

Size:—40" × 40", 1000 × 1000 mm. and 2500 × 1000 mm. as well as in rolls of 1000 mm. of width and 50 to 100 m. (not m/m.) or 100 yards per roll in length.

Thickness:—.005", .008" etc.

Use.—Suitable for rolling into Tubes, cylinders, or heated Mondrels. A group of bars or wires with a 2 m/m. layer of

Mica folio pressed around it any tube made this way, will stand a test with 25.000 volts without any danger of puncture. In short-time tests, puncture does not occur until 40,000 Volts is exceeded.

7. Commutator Micanite:—

Size.—18" × 46", 40" × 23" etc.

Thickness — .020", (i. e. 0.5 m·m), .025", .028", .030", .032", .040", .042", .046" .048", .050" etc.

Used largely in Commutator segments etc.

8. Mica Paper Tapes:—Paptr one side and Mica on the other. These Tapes are also made with silk on one side and Mica on the other, which is called Mica Silk Tapes. With papers on one side, Linen on the othet, and Mica in the middle, the product is called Mica Paper Silk Tapes. These tapes are suitable as high grade insulating medium and can be conveniently wrapped or folded in any desired manner.

Size—Rolls of 50 yards (also 100 liner feet) each ½", ⅝", ¾", ⅞", and 1" in width.

Thickness — .005", .007", .008", .012" or 0 1 to 0.5 mm.

Use—Mica Tapes serve specially to insulate armature coils of motors for traction of high power, on account of the great proportion of mica contained in it and give insulation at high temperatures.

Puncture Voltage—700 per mil.

9. Mica Asbestos Sheets:— (Heat resisting Asbestos with a layer of Mica)

Size:—About 1000 × 500 mm. or 40" × 20".

Thickness — 0.4 mm., 0.7 mm and above.

This ordinarily consists of a layer of Mica or 0.2 m/m. on one side and a layer of asbestos of at least 0.5 m/m. thick on the other.

Use—It is employed in the mounting of electrical heating apparatus and for the insulation of windings of flat copper pole pieces, for motors and Alternators of high power and Temperature.

10. Micanite Tubes:—*Size—Usuall 36" (3' feet) or 18" (1½' ft.) in length with wall thickness of ⅛", 1/16", ⅜" etc. and* bores of ¼", ⅜", ½", ⅝", ¾" 1", 1¼", 1½" etc.

11. Red Tape Paper and Mica:—Made of two layers of carefully selected India films and best grade tissue paper, faced on one side with Red Rope Paper. It is very useful for Armature and Transformer work, requiring medium voltage or temperature.

Standard size:—36" × 36".

Thickness usually are—.003", 005", .007", .010", .015" etc.

12. Fishpaper and Mica:—Made of two overlapping layers of carefully selected Mica Films bound on one side with Tissue paper and on the other side with Fish paper.

It is similar to Red Rope paper and Mica or Press Board and Mica but mechanically stronger than both and recommended for low voltage work requiring mechanical strength.

Size—36" × 36".

Thickness—.010", .012", .020", etc.

13. Art Mica: — Compressed Sheet Micanite made of best grade of India Mica films.

Size—18" × 36".

Thickness—.020" etc.

Use—For Torchiere Chimneys, Cylinders, shades, panels etc. Largest use is in manufacturing cylinders.

14. Micanite Press Pan — Flexible Micanite covered with Press Pan.—Stronger than Flexible Micanite. Used for Armature and Transformer insulation.

Size—23" × 31½" or 600 × 800 m/m.

Thickness—.012" to .040" or 10 mm. etc.

Notes—The U. S. A. Navy Specification standardises the dimension of pressed Mica Plates at 18" $\times$ 36" and call for finished sheets or perfectly smooth surface, with minimum quantity of binding cement in thickness upto 0.015" inch,—made of knife-trimmed evenly split Splittings, .0008" to 001" thick,—for heavier Plates each constituent laminae not to exceed .002". The di-electric strength of all grades of Pressed Micanite Plates must be enough to withstand momentary application of 800 Volts per mil of thickness between flat metal plates or 900 volts between pointed or sperical electrodes—and the continuous application of 500 volts per mil of thickness for 60 seconds. The binding cement should be a high grade insulator, free from waxy substance never exceeding 5 per cent. of the weight of the finished Commutator Plates, 15 per cent. of the weight of Hot Plates and moulded 20 per cent. of the weight of Flexible and Bold-moulded Plates.

Micarta—It is a strong dense matesial, made of Mica Splittings manufactured in America. Some of the uses of Micarta are described below:—

Aeroplane firewalls, cabin lining, wing covering pulleys &c Angles, Bushings, Brush-holders, Book-covers, Brackets, Cordterminals, cleats, cable-joints, channels, cores, counter-tops, desk and bench tops, decorations, discs, door-panels, embossed washers, entrance bushing, fan-blades, fairleads, friction discs, furniture veneers, industrial and automatic gears, gaskets, handles, hospital table-tops, insulations, ignition coil bores, Miner's hats, mandrels, markers, ornamental display, rail joint insulaion, radio panels, and parts, serving trays, switch-boards, switch bases &c; Transformer spacers, telephone apparatus, train line jumper insulation, valve washers, veneering &c.

Manufacture of Special Kinds of Paper

PARCHMENT PAPER

The parchment is generally prepared by passing a continuous sheet of paper through a bath of acid of the proper strength at a speed which ensures the correct period of immersion. As the treated paper leaves the bath it passes through squeezing rolls which remove the excess of acid, and the paper is then led through a series of tanks containing fresh water, the last traces of acid being neutralised by small additions of ammonia, or some alkali, to the first washing tank. The wet parchment is then passed through suitable rollers and carefully dried over cylinders heated internally by steam. The paper is kept perfectly stretched as it dries, because it shrinks enormously, and would otherwise become cockled and uneven.

The acid is employed at a strength of 1.71 specific gravity, being prepared by diluting the commercial concentrated acid in a leaden vessel, with a sufficient quantity of water.

The best parchment is made from pure cellulose such as rag or chemical wood pulp. The quality of the parchment depends upon attention to the strength of the acid, the temperature of the acid bath, the period of immersion, the complete removal of the said, and the careful drying of the wet parchment.

Thick sheets of parchment paper are frequently made by passing three sheets of

paper through the acid bath and bringing them together between the rollers before washing. The sheets unite when pressed together; the remainder of the process being the same as that employed for single sheets.

The parchment exhibits remarkable difference to the original paper, the strength being increased three or four times, the density about 30 per cent., the latter being shown by the shrinkage, which amounts to at least 30 per cent.

VULCANISED PAPER

Zinc chloride has the property of parchmentising paper in a manner similar to sulphuric acid. The product obtained when this reagent is used is generally termed vulcanised fibre. The paper is passed as a continuous sheet into a bath of strong zinc chloride, having a density of 160-170 Twaddell, which causes the cellulose to swell up and partly gelatinise. A very large excess of strong zinc chloride is necessary, and the process is only rendered commercially possible by careful recovery of the zinc from the washing waters, which are submitted to chemical treatment.

The vulcanised product is subsequently with nitric acid or with a mixture of nitric and sulphuric acids to render them waterproof. Dextrin is frequently to retard the chemical action to permit of the necessary manipulation of the material before it is finally washed. The complete removal of the excess of zinc and acid is a necessary feature of the whole operation.

WILLESDEN PAPER

When paper is passed through an ammoniacal solution copper oxide, a superficial gelatinisation of the surface takes place, so that the paper when washed and dried is impregnated with copper oxide, which helps to preserve it, and it becomes waterproof. Such material is well known as Willesden paper.

BLUE PRINT OR CYANOTYPE PAPER

It is a useful method of reproducing drawings, and incidentally is of great value to the amateur photographer because of the facility with which it can be applied for getting proofs from negatives quickly and easily without special baths and chemicals. The process is based upon the reduction of a ferric salt to the ferrous condition by light, and the formation of Prussian blue by the action of potassium ferricyanide. The negative cyanotype gives white lines on a blue ground. Various formulae are in common use.

	Herschel.	Clark.	Watt.	Rockwood.
Solution 1.				
Potassium ferricyanide ..	16	27	48	10
Water	100	100	100	100
Ammonia ..	—	2.3	—	—
Saturated solution of oxalic acid .	—	20	—	—

	Herschel.	Clark.	Watt.	Rockwood.
Solution 2.				
Ammonia-citrate of iron ..	20	30	50	30
Water	100	100	100	100
Boric acid	—	—	0.5	—
Dextrin	—	—	—	5

Equal parts of the two prepared solutions are mixed when required and spread evenly over well-sized paper. The paper is hung up, dried, and preserved in a dark dry place.

The positive cyanotype gives blue lines on a white ground, being the reverse of the ordinary blue print. That is, no image is formed where the light acts, and the reaction is the formation of blue due to the union of a ferrous salt with ferrocyanide of potassium.

PIZZIGHELLI'S FORMULAS

	Solution 1.	Solution 2.	Solution 3.	Solution 4.
Water	100	100	100	100
Gum arabic	20	—	—	—
Ammonia-citrate of iron	—	50	—	—
Ferric chloride	—	—	50	—
Potassium ferrocyanide	—	—	—	20

Mix the first three solutions in the following order in the proportions stated:—

Solution 1	20	parts.
Solution 2	8	,,
Solution 3	5	,,

As soon as the solution, which at first gets thick and cloudy, is clear and thin, it is spread over the surface of well-sized paper, which is then dried in a warm room.

The print, which appears yellow on a dark yellow ground, is treated with the developer (solution 4) by means of a brush dipped in the solution. When the image is deep blue in colour, the print is washed in water and then placed in dilute hydrochloric acid (1 part of acid to 10 parts of water) till the ground is quite white. A final washing with water is then necessary.

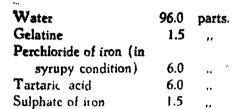
Waterhouse gives the following formula:—

	Solution 1.	Solution 2.	Solution 3.	Solution 4.
Water	650	150	—	100
Gum arabic	170	—	—	—
Tartaric acid	—	40	—	—
Ferric chloride solution 45°. Beaume.	—	—	150	—
Ferrocyanide of potassium	—	—	—	20

Solutions 1 and 2 are mixed and No. 3 added gradually with constant stirring. The mixture is left twenty-four hours, and diluted with water to a specific gravity of 1.100.

The paper is coated with the solution used as already directed, being developed in ferrocyanide of potassium solution and washed with water, treated with weak hydrochloric acid and then finally cleaned from all traces of acid.

Black Lines on a white Ground.—This modification of the ordinary blue print is arrived at with the following formula:—

Water	96.0	parts.
Gelatine	1.5	,,
Perchloride of iron (in syrupy condition)	6.0	,,
Tartaric acid	6.0	,,
Sulphate of iron	1.5	,,

The paper is coated with the solution. After printing, the image is developed with a solution containing.

Gallic acid	1	part.
Alcohol	10	parts.
Water	50	,,

A final washing of the print with water completes the operation.

COATED PAPERS

This term should properly include all the varieties of special papers which are coated with extraneous matter for particular purposes, such as art, chrome, tinfoil, gilt, emery, carbon, photographic, marble, and sand papers. In practice, however, the term is almost entirely limited to "art" papers used for illustration work and half-tone printing.

An "art" paper, using the definition given above, consists of an ordinary sheet of paper, one or both sides of which have been coated by the applications of a mixture of a mineral matter, such as china clay or satin white, and some adhesive, like casein or glue. The object of the coating is to impart to the paper a perfectly smooth surface, rendered necessary because of the conditions under which the printing of the illustrations is carried out.

The machine used for coating the paper consists of a large hollow drum about 40 inches diameter and 48 inches wide. The paper is brought over upon the drum in a continuous sheet, and the coating mixture applied to the surface by means of a revolving brush or an endless felt which rotates in a copper trough containing a coating mixture which is usually maintained at a temperature of 120° Fahr.

The amount of material put on to the surface of the paper is varied by altering the proportion of water in the trough. As the wet coated paper is drawn over the drum it comes into contact with a number of flat brushes which move from side to side and brush the coating well into the paper.

The last two or three brushes on the drum are made of very fine bristles, so that when the coated paper leaves the machine the surface is perfectly even and free from brush marks. The wet paper is then drawn up an inclined ladder by an ingenious device, which causes the paper to fall into festoons or loops, and these are carried bodily forward by means of travelling chains.

The paper is dried by a current of warm air which can be obtained by means of steam pipes placed below the festoons or with a special air blower. The dry paper is then led through guide rolls and wound up in the form of a reel.

The paper at this stage has a dull coated surface, which is somewhat rough and unfinished, and a high polish is imparted to it by a machine known as a supercalender.

The supercalender consists of a number of alternate steel and cotton or paper rolls placed vertically in a stack one above the other. When the coated paper is led through this machine the friction of the alternate steel and cotton rolls produces a high finish on its surface.

Tinted art papers are prepared in the same manner, the desired colour being obtained by the addition of pigments or aniline dyes to the mixture in the trough containing the coating materials.

WAXED PAPER

The paper in the form of a continuous sheet is passed through a bath of melted wax at a high temperature, any excess being removed by squeezing rolls through which the hot waxed paper is passed. The paper is led over skeleton drums and

thoroughly cooled before being cut into sheets.

BUTTER PAPER

Ordinary parchment paper is generally used, but for special purposes a solution containing albumen and saltpetre is utilised for impregnating paper.

HARDWARE PAPER

Needles and silver goods are frequently wrapped in paper impregnated or mixed with substances which are supposed to prevent deleterious fumes from coming into contact with them. The use of black papers heavily loaded with pigment, sized with glue and an excess of alum, is commonly resorted to. For silver ware, paper dipped in a solution of caustic soda containing zinc oxide is used. A recent patent suggests the impregnation of paper with heavy hydrocarbon oils, which slightly volatile cover the goods, such as needles, with a thin film.

PARAFFIN PAPER

Large quantities of this paper are consumed for packing food and other articles which need protection from air and moisture.

The paper is either passed through a bath of paraffin or passed over a roller which rotates in a trough of paraffin.

If the paper is to be coated on both sides it is passed through the bath containing the paraffin in a melted condition, the excess of which is scraped from the paper as it leaves the bath. The paper is cooled by exposure tt air, and when the paraffin has solidified upon the sheet the paper is wound up on a roller at the end of the machine.

If the paper is to be coated on one side only it is passed over a heated roller which revolves in a bath of melted paraffin, the other operations of drying and finishing being the same as in the case of a paper coated on both sides.

Tinfoil Papers, required for packing tea, coffee, and similar foodstuffs, are prepared by coating cheap paper with a solution of gum and finely powdered tin. The manufacture of the fine powder is accomplished by melting tin at a low temperature and shaking it continually as it cools down, whereby a mixture of fine powder and large particles is produced, the latter being separated out by agitation of water.

Tin in fine state of division can also be obtained by a chemical process. Granulated tin is dissolved in strong hydrochloric acid, the solution diluted with water, and a stick of zinc introduced into the solution. The tin is gradually precipitated.

The dried powder is coated on to the paper with gum, and when the paper is dry the necessary degree of brilliancy produced by suitable calendering.

TRANSFER PAPERS

A number of important operations require the use of what are known as transfer papers, so that a design written or printed upon a specially prepared surface can be transferred to another surface from which duplicate copies may be obtained. The principle upon which all such operations are based is the coating of suitable paper with starch, flour, and gum, singly or mixed, so as to give a surface firm enough to take the design, but which readily breaks up when the printed side is pressed against the wood, stone, or metal object intended to receive the design.

Thus a paper may first be dusted over with dry starch, or coated with starch paste and then dried. A layer of dextrine may then be put over the starch coating, and the design printed upon the dextrine surface. When the paper is turned face downward on a sticky metal plate the design adheres to the metal, and the paper is easily pulled off, owing to the dry starch layer between it and the dextrine being non-adhesive.

This principle is utilised in producing designs upon tins used for packing, metal advertisement plates, domestic articles of every kind, stoneware and earthenware goods.

It is further applied in the preparation of lithographic stones required for printing.

Each class of work demands paper of a suitable character, but the principle of an easily detached surface-coating is the same for all. The main difficulty experienced is the liability of paper to stretch when damped, and various methods are devised to obviate this, either by employing paper which stretches very little when damp, or by making the paper partially waterproof before use.

PAPIER-MACHE

This name indicates a preparation of paper or paper pulp mixed with various mineral substances firmly cemented together by animal or vegetable adhesive.

The paper pulp used for high-class goods consists of pure wood cellulose while for the commoner qualities mechanical wood pulp, waste paper, and any similar fibrous material are employed.

The mineral substances used are china clay, chalk, gypsum, barytes, ochre, sienna, and other mineral pigments.

The adhesive materials are glue, casein, gum, starch paste, dextrine, Iceland moss, or wax.

For experimental purposes, small quantities of papiermache may be prepared in the following manner:—

When old newspapers or brown papers are used as the fibrous basis of the papier-mache, they are first torn up into small pieces, moistened with hot water, tied up in a small cloth bag or sack, which must only be half filled, and then immersed in a basin of warm water and thoroughly kneaded by hand, so that the paper is gradually reduced to the condition of pulp. If the kneading process is carried out thoroughly the paper is entirely reduced to pulp. The excess of water can be removed by pressure and the preparation of the final mixture completed by the incorporation of clay, pigment, and adhesive.

In the preparation of papier-mache for goods on a large scale a beating engine is used in order to break up the old paper or wood pulp into a fibrous condition.

The following formulae can be used for making papiermache:—

(1)		(2)		(3)		(4)	
Pulp	22	Pulp	22	Pulp	12	Pulp	33
Clay	37	Chalk	30	Rosin size	22	Starch	9
Casein	37	Glue	4	Flour	11	Clay	9
Water	4	Water	44	China clay	11	Water	49
				Water	44		

PLASTER MOULDS.—Plaster of Paris or gypsum is the main article used for moulds and pattern. The preparation of gypsum for casting is made as follows:—The gypsum is gradually worked up into a creamy paste with water, the mixing being done quickly yet thoroughly.

The pattern of which it is desired to form a mould must be coated with oil. Around the pattern placed on a table a wall of wood or pasteboard is fixed, so that a basin will be formed of suitable depth, preventing the gypsum from flowing away. patterns of figures or of curved articles have to be made in two or more parts. For that purpose pattern is usually cut into

two pieces. Two moulds are now readily obtainable by first oiling the pattern and by pouring the gypsum in a thin state gradually over the surface, to avoid the forming of air bubbles.

The rapid drying of the soaked gypsum is sometimes inconvenient, but the addition of a saturated solution of borax in water to the gypsum mixture can be resorted to as a check.

Various means are employed for hardening and strengthening the plaster cast, such as the addition of coarse paper fibres, shreds of canvas, iron filings, or wire.

COLOURING.—Usually a cheap water colour only is required; a light coating of a cheap varnish may be sufficient. In other cases a water colour serving as a filler for smoothing, the surface may receive a finish of one or more coats of resinous solutions in alcohol or of copal varnish. Many goods are coated with asphaltum or Japan varnish and dried in cold or hot air.

Some of the articles may be decorated with scrolls or arabesques in oil colours or enamels, or the lines may be covered with bronze powder, or with metal, gold, or aluminium leaf.

VARNISHING.—The following varnish recipes are suitable:—

(1)		(2)		(3)		(4)	
Shellac	20	Shellac	10	Shellac	6	Sandarac	15
Alcohol	70	Rosin	10	Sandarac	3	Mastic	5
Lamp black	10	Alcohol	60	Mastic	18	Turpentine	5
		Lamp black	20	Alcohol	73	Alcohol	75

Manufacture of Glass Tubing and Rod

THE HAND SYSTEM OF MANUFACTURE

In the hand system a ball of glass is gathered from the furnace on a blow-iron, and is rolled on a small iron table or marver to give it an even and slightly conical shape. The gathering of glass loses heat during the marvering and becomes too stiff for drawing. It accordingly has to be re-heated in a small subsidiary furnace, called in the trade a "glory-hole, because it suggested to some of the early glass-makers the conditions they might expect when they departed to another world. The first glory-holes were fired with wood and cobs of coal, giving a picturesque appearance of smoke mixed with leaping flames. Oil firing is now more general, providing greater and more consistent heat.

After it has been re-heated the glass, which has retained its symmetrical marved from, is "struck-up" on an iron post, carried by a helper. The glass is now supported at both ends, and is drawn out by the tube-drawer walking backwards from the post-holder, who is usually a youth. The glass is twisted slowly during the draw, and the operator blows his iron at short intervals to maintain the air cavity in the tubing. A third man gauges the tubing with callipers while it is being drawn. This assistant cools the tube by flapping the air near it with a sheet of leather, thus preventing it being drawn to

narrower diameter than the one required. ilass rod is made in exactly the same way xcept that the gathering is on a solid iron.

By altering the speed of drawing, and y varying the size and shape of the iathering, an experienced man can draw ubes of various diameters with fair accuacy. The gathering may be from 4 in. o 8 in. in diameter, and from 6 in. to 12 in. n length. The tubing drawn from this anges from 3/32 in. to 6 in. in diameter nd, as regards the smaller sizes, to well ver 100 ft. in length. The hand process very slow and wasteful. Much of the ass remains attached to the irons at her end, and cannot be used.

THE SEMI-AUTOMATIC PROCESS

This consists of a mass of clear glass iich will form the body of the thermoeter, with which is incorporated red and iite enamel glasses to form the background of the tube. Even the channel rough the centre is present at this stage, ing afterwards so reduced in diameter ring the drawing operation as to become rdly visible to the naked eye. Up to s point the work has all been done by nd, including laying the white and red ites or strips on the clear glass gathers is for the drawing operation that a chine is sometimes employed.

When the gob is ready it is mounted a machine which draws the tubing tically to a height of as much as 160 ft. nore elaborate form of the Corning "upw" machine produces the larger diaters of tubing by a method resembling Fourcault process for sheet glass. Air blown through the centre of a circular actory block immersed in the galss, and m this beginning the tube is drawn tically.

THE DANNER PROCESS

In the Danner process the glass is lted in a tank furnace of normal design, d flows from this into a conditioning chamber, where it is skimmed and its temperature accurately adjusted. It continues down on to a slowly-revolving hollow mandrel, the flow being regulated by a gate that can be raised or lowered. The mandrel is a clay sleeve mounted upon a hollow shaft, which is designed so that its axis can be tilted downwards to the best working angle, which is usually found to be about 20°. The stream of glass winds round the lower end of the mandrel and is given a downward axial flow by gravity. At the top, where the glass first impinges, spiral waves are visible, but these smooth out before it is drawn off at the end of the mandrel.

The temperature of the glass, the air pressure, and the drawing speed can all be adjusted to control the size of tubing required. The air is blown through the hollow shaft into the interior of the tube. By shutting off this air the changeover from tube to rod is effected.

The drawing apparatus is situated up to several hundred feet from the furnace. The pulling device consists of two endless chains, each running on two sprockets and arranged one above the other. The chains carry asbestos pads so that the tubing shall not come in contact with the metal, and the distance between the upper and the lower can be adjustetd to accommodate tubes of di:erent diameters. The drawing speed is controlled by a variable-speed motor.

The tubing is fed centrally between the chains of the pulling mechanism by guide wheels, and is carried along the tube run from the furnace by a series of grooved pulleys, which not only largely prevent friction, but lessen the amount of pull necessary from the machine. A few years after the Danner machine was invented tubing was being drawn on it at the rate of 140 ft. per minute, and this speed has since been greatly increased. It should be noted that the machine method of

making glass tubing not only avoids the waste of the hand method, as all the glass is used, but that the automatic process has the further important advantage that once the various facors are properly adjusted the resulting tubing continues to be within very fine limits of accuracy for weight, diameter, and wall thickness. When it leaves the puller the tubing is automatically cut to any desired length and delivered to a rack. As a rule, it is also gauged automatically and separated into series of sizes.

THE VELLO PROCESS

The principle of the Vello machine represents a marked advance upon that of the Danner machine. The molten glass drops vertically from the forehearth of the furnace through an annular space surrounding a rotating, hollow, refractory pipe. Eeffctive use is accordingly made of the force of gravity. The forehearth temperature is specially critical, but once this is properly adjusted the machine will draw tubing of a given size about twice as fast as the Danner.

The Vello machine is particularly suitable for the manufacture of tubing required in great bulk, so that the mass production is fully justified. It is used for producing exhaust tubing for electric light bulbs, clear neon tubing, fuse tubing for cars, etc. It can also be adapted, like the Danner, to produce glass rod.

FILIGREE CANE

Filigree is rod or tube containing opal or coloured threads, either straight, spiral, or interlaced within a transparent glass. The threads follow the whole length of the cane or tube. This curious form of glass-work was originated by the Venetians, who have remained exceptionally skilled in producing elegant and ornamental filigree-decorated glassware.

The method of producing filigree cane consists in first taking a number of short lengths of opal or coloured cane previously drawn and cut to about 6 in. lengths. These are then placed in vertical positions around the inner circumference of an iron cup mould, which may be about 5 in. in diameter. The opal strips of cane are supported vertically in small recesses provided at equidistant intervals in the rim of the mould. A ball of hot crystal glass, is gathered on a pontil and is lowered into the inside of the mould. The hot metal, coming in contact with the opal strips of glass, adheres to them, and upon withdrawal the glass brings the opal or other strips away with it, arranged in sections round the circumference of the ball of glass. This is now reheated and marvered until the canes or strips of opal are well embedded in the hot glass. Then the workman gathers another coating of hot glass over the whole, marvers it again into a cylindrical form, and proceeds to draw it out as already described for hand tube-drawing.

If a spiral form of lines is desired the workmen, while drawing out the cane, turn or twist the pontil and post in contrary directions. These rotations cause the opal veins or threads to assume a spiral or twisted form within the glass. Variously coloured canes may be used in the above process, and by placing them in alternate positions to the opal strips in the mould some very pretty and curious filigree work is obtained. These twisted filigree canes are used and manipulated over again in the process of making the various Venetian gobles and wine stems.

SPUN GLASS

The term Spun Glass is used to describe the hand-made glass thread which was the forerunner of the automatically mass-produced Fibre Glass of to-day. The method of making spun glass thread consisted in melting the end of a plain or coloured glass rod (which might be square, round or triangular in section in

ning-wheel was in the textile trade. We a blow-pipe flame: grasping the end which is melted with a pair of pincers: drawing it out and fixing it to a wooden drum, which is turned rapidly away from the glass being heated. The drum might be 2 or 3 ft. in diameter, and as the glass is continually fed into the heat it is drawn out into a very thread by the revolving drum, and coiled up until a sufficient quantity has been obtained. The thread is then cut across the drum and collected.

Spun glass, although not having the wide range of service possessed by the modern fibre glass, had nevertheless many uses. It was first employed in making fancy ornaments, as for example in forming the tails of glass birds. Here was very evident the irridescence and variety of colours yielded by the refraction of light between the glass threads, which gives spun glass its peculiar effect. Later the glass was spun into a thread so fine and flexible that it could be worked into a fabric like any other textile material. Its use for any such purpose remained uncommon, however, being confined to such articles as glass ties. Lastly came industrial applications. Spun glass fibre was employed in making the brushes used for cleaning metals with acids. It was also made into filter cloth used successfully in filtering acid residues in certain chemical processes. Compared with the product of to-day, however, the old spun glass was lacking in strength and elasticity.

The term "spun glass" was derived from the revolving wheel on which it was made. The process was a hand one in just the same way as the use of the hand spinning-wheel was in the textile trade. We have been considering, therefore, what was still a very primitive operation.

FIBRE GLASS

Since about 1933 means have been developed of producing glass fibres continuously and automatically at low cost. In consequence the use of the material has been enormously expanded. Fibre glass is now commonly employed for heat insulation in trains, ships, and even public buildings and houses, in addition to many other systems. Only the staple fibre system is described below.

There are now two automatic methods of production for fibre glass. These are known respectively as (a) the Staple Fibre, and (b) the Continuous Filament systems. Only the staple fibre system is described below.

STAPLE FIBRE

By this method glass flows from large tank furnaces through extremely small orifices. It is then picked up by high pressure steam or air blast and pulled into fine fibres at riflebullet speed. Each fibre has an average length of about 9 in. and is about 0.00027 in. in diameter, being smooth in quality and cylindrical in shape. As they are blown the fibres fall like snow on to a travelling belt moving below the orifices. A little lubricant is sprayed on the fibres at this stage to minimize friction later.

It is in this way that glass wool in bulk is formed. When gathered from the conveyor belt the glass fibres are made into rolls and blankets for insulation purposes, or chopped into what is known as nodulated or granulated glass wool.

Modern Hair and Scalp Preparations

by F. Milos

Hair care preparations have a very considerable importance in the modern cosmetic industry. They are extremely numerous not only because of the great number of producers, but also because of the many purposes for which they are intended and the many tasks they are supposed to fulfill.

Hair care products have both esthetic and cosmetic purposes. There are products which definitely belong to either one of these groups, but there are also many which serve both purposes: for instance lotions which cleanse the scalp and the hair and give them an agreeable fragrance (esthetic action), and which moreover have a fortifying and tonic action on the scalp and favour the growth of the hair (cosmetic action). These lotions are among the most modern products whereas some other products such as hair pomade, have lost their original meaning and have been superseded by more efficient products.

Falling hair is a malady which has given rise to many hair care products, most of which do not keep the promises of the clamorous publicity.

The problems of the hair becoming grey prematurely, the formation of drandruff, and baldness, with which cosmeticians have been busy for centuries have not been satisfactorily solved so far. The only possible action against falling hair is suitable care of the scalp with appropriate products. The purpose of this article is to examine the suitability and action of raw materials used for such preparations, giving formulas and manufacturing methods.

In most cases, hair and scalp care will be limited to nourishing the hair and keeping the scalp in a healthy condition; because any successful action by external means is not possible when as is often the case, the illness is a secondary symptom of some internal malady.

Therefore, no cosmetics can be of use if the primary cause, which requires medical treatment, is not eliminated. Likewise, complicated parasitic diseases of the scalp do not belong to the cosmetic field.

As a rule alopecia is the result of an abnormal function of the sebaceous glands, if not of an internal malady, and it is one of the most troublesome diseases of the scalp. The same may be said of Seborrhoe, the treatment of which belongs partly to the cosmetic field, and partly, in serious cases, to the pharmaceutical or medical field.

Scalp massage has a good fortifying action and this may be improved still more by adding mild irritants.

All preparations for the hair do not have the same action on the scalp. Therefore many preparations contain combinations of several raw materials and their action is the total result of these combined substances.

The hair care products which we shall examine, fall into the following groups:—

(a) Hair cleansing products.
(b) Lotions.
(c) Hair oils and liquid brilliantines.
(d) Solid brilliantines and hair pomades.
(e) Hair fixatives.

Hair dyes, etc. belong to another group of esthetic hair rare products and form a separate field of the cosmetic industry.

HAIR CLEANSING PRODUCTS

Shampoos are an important group, and many of them are based on soap or soapy products. Modern shampoos, so called

non-alkaline shampoos, are based on Turkish red oils, especially also on sulphonated fatty alcohols and fatty acid condensation which show many advantages as compared with soaps.

An efficient hair cleansing product should comply with the following requirements:—

(a) Good foaming and cleansing action, even in hard water.

(b) The reaction should not be alkaline, but neutral or slightly acid.

(c) Formation of unsoluble calcium or magnesium soaps should be prevented by suitable additions.

(d) Good and easy solubility is requested.

(e) The shampoos should not be noxious and should not irritate.

(f) The hair substances and the natural hair colour should not be affected, and the hair should show an attractive gloss after washing. The natural oils of the hair and the scalp should not be intensively removed.

Shampoos with soap bases are good cleansing, wetting and dispersent agents but they have the disadvantage of being due to the hydrolysis of the soap solutions. The calcium and magnesium soaps formed when washing the hair stick to the hair and cannot be removed by rinsing with water. Therefore, hair washed with simple soap shampoos must always be rinsed with an acid solution which destroys the calcium and magnesium soaps so that these can be removed by rinsing with water.

Another drawback due to the hydrolysis of the soap solutions is the irritation of the scalp by alkalis and the alkaline swelling of the hair substances.

For shampoo powder, a neutral soap which does not contain more than 50 per cent coconut oil in the fatty base is suitable.

Basic soaps with higher coconut oil contents would easily irritate the skin. In a shampoo, the proportion of pulverised soap with 80-88 per cent. fatty acids is 60 to 90 per cent. The balance of 10 to 40 per cent. consists of mild alkalis (borax, sodium bicarbonate) and substances to prevent calcium soap formation (sodium pyrophosphate, sodium metaphosphate). Mostly fats for shampoo powder are saponified with NaOH.

However, when stearin is used, it will be neutralized partly or wholly with KOH and pulverized after having been dried for several weeks.

Myristic acid is also a very suitable fat for shampoo soaps and it may completely replace coconut oil.

BASES FOR SHAMPOO POWDER (SODIUM SAPONIFICATION)

		per cent.
(1)	Coconut oil	40
	Olive oil	30
	Talcum	30
(2)	Palm oil	30
	Myristic acid	50
	Olive oil	20

STEARIN POTASSIUM SOAP FOR SHAMPOO POWDER (POTASSIUM SAPONIFICATION)

	per cent.
Stearin	100
Cocoa-sodium soap powdered	40
KOH 50°Be.	40

It should be stressed that powdered cocoa soap is to be used (dissolved in molten stearin on a water bath), and no coconut oil should be used, in order to prevent the formation of spots of lye and incomplete saponification. After, preparation and cooling, the soft soap is cut into chips and dried for a considerable time in the air (in some cases several weeks). After having become sufficiently hard, it is powdered.

SHAMPOO POWDER

		per cent.
(1)	Powdered basic soap	80
	Sodium metaphosphate	5
	Sodium bicarbonate	10
	Borax	5
(2)	Powdered Stearin potassium soap	70
	Sodium pyrophosphate	5
	Borax	10
	Sodium bicarbonate	15
(3)	Powdered basic soap	50
	Powdered stearin potassium soap	40
	Di-sodium phosphate	5
	Borax	5

For perfuming shampoo powder, 0.5 per cent. of a suitable compound should be used, spraying it over part of the shampoo; next the perfumed powder is mixed with the unperfumed part and then sifted. 0.5 per cent. of a good soap perfume oil should be sufficient for shampoo.

The perfume should, however, be well fixed. When selecting perfume essences, only such qualities should be taken which are alkali resistant especially when soda ($Na_2\ CO_3$) is an ingredient of the shampoo. However, in modern shampoos this is hardly the case.

In the above shampoos, the washing-active action of the powder is based on soap. At the present time many shampoos are elaborated without soap, and the washing-active action of such products is based on fatty acid condensation products or fatty alcohol sulphonates, either alone or in combination with soap. Among the fatty acid condensation products, we may mention the Igepones, which develop a good foaming action and are resistant to calcium, acids and lyes and have a neutral reaction. Among the fatty alcohol sulphonates, sodium-aluryl sulphonate or sodium cetyl sulphonate are useful, not being subject to hydrolysis, and therefore being resistant to calcium.

Fatty alcohol sulphonates have a good wetting and washing power and therefore they strongly degrease the hair and the scalp. Therefore they are usually used in diluted form.

As a solvent, sodium sulphate is often used, a proportion of which is still contained in the product as the result of the manufacture of the sulphonate. As fatty alcohol sulphonates and condensation products are usually combined with weak acids, their solutions have a slight acid reaction and their pH is about 5, which is very near the isoelectric point of the hair which is about 5.6-5.9. By this very weak acid reaction the hair is not affected at all, which has been confirmed by clinical tests.

SHAMPOO WITH FATTY ALCOHOL SULPHONATE

Sodium lauryl sulphonate	65	per cent.
Boric acid	4	" "
Sodium sulphate	31	" "

When perfuming these sulphonate shampoos, it should be considered that these have the smell of the fatty alcohol and that the hair keeps this smell. To cover it, several fragrances, such as Chypre and Violet are very suitable.

For fair chamomile-shampoos are especially recommended. Often powdered chamomile blossoms are added to such shampoos, or still better dry chamomile extract.

CHAMOMILE-SHAMPOO

Powdered basic soap	60	per cent.
Borax	20	" "
Sodium bicarbonate	12	" "
Chamomile extract powdered	5	" "

Bleaching shampoos generally contain sodium perborate which develops oxygen. When manufacturing this shampoo type, it should be considered that sodium perborate keeps well only in dry powder.

Therefore the addition of some soda ash is recommended. Fatty alcohol sulphonates also have a stabilizing action on the perborate.

Only stabilized ingredients of perborate are to be used.

Sodium perborate contains 10.5 per cent. of active oxygen. In order to avoid damage to the hair by oxygen, no more than 10 per cent. of perborate should be used, so that shampoo contains only 1 per cent. of active oxygen.

For this reason, the bleaching action of shampoo is also very moderate.

SHAMPOO FOR BLOND HAIR WITH SODIUM PERBORATE

Powdered basic soap	50	per cent.
Sodium lauryl sulphonate	20	,, ,,
Sodium carbonate	5	,, ,,
Sodium bicarbonate	15	,, ,,
Sodium perborate stabilized	10	,, ,,

LIQUID SHAMPOOS

Generally these are liquid potassium soaps in a concentration of 20-30 per cent. of fatty acid content. But solutions of fatty alcohol sulphonates, saponines and sapamines (salts of the diethanolaminethyl oleyl-amid or diethyl aminol ethyl-stearyl-amid) are also used in modern liquid shampoos.

These liquid shampoos are very practical. They may be packed in handy bottles in crystal clear condition and they may be well perfumed so that they have good sales.

For liquid soaps, a good quality of minimum 20 per cent. fatty acid content is advisable, although one often finds inferior qualities of 15, or even of 10 per cent. fatty acid content Such inferior qualities do not meet with lasting appreciation and should be rejected from the commercial point of view. Considering the cost price of liquid shampoo, which is generally packed in 100 or 200 gr. bottles, it is found that the liquid soap forms the smallest cost price element and that the packing material is more important than the contents. Therefore excellent qualities of soap should be preferred as this will not make a large difference in price.

Preferably a quality between 20 and 30 per cent. of fatty acid content should be selected.

The manufacture of potassium soap for liquid shampoo may be done according to the semi-boiled process. The soap should have a neutral reaction and the fats should be completely saponified. In better qualities, coconut oil is never used alone but in combination with other suitable oils, such as sunflower oil, olein, castor oil, soya bean oil, etc. Coconut oil used alone results in a very fluid soap which can irritate the scalp and affect the hair.

A good liquid soap for scalp cleansing purposes should have the following properties:—

(1) Good transparency: no turbidity may occur, not even in case of prolonged storage.

(2) The soap may not gelatinate.

(3) Sufficient viscosity and good foaming power.

(4) Absence of free caustic alkalinity.

Transparency is obtained by suitable filtering methods. The liquid soap regulated to have a definite fatty acid content is allowed to stand for one or two weeks in a cool room. During this time a deposit is formed on the bottom of the container. The clear soap liberated from this deposit is then filtered.

Here are some good fat mixtures for liquid shampoo soap:—

(1)	Coconut oil	50	per cent.
	Olive oil	30	,, ,,
	Castor oil	20	,, ,,
(2)	Coconut oil	30	per cent.
	Oleine	35	,, ,,
	Castor oil	25	,, ,,
	Lard	5	,, ,,
	Arachide oil	5	,, ,,

To perfume liquid shampoo soap, special perfume compounds are used and it is advisable to buy them from well-known manufacturers of perfume essences.

As a rule the proportion of perfume should not exceed 0.7 per cent. because the hair retains the fragrance longer than the skin. With a view to aiding the solubility of the essence and improving the the quality of the soap, it is advisable to dissolve the perfume essence in an equal quantity of alcohol before mixing it with the liquid soap.

Liquid shampoos containing certain cosmetic substances are sometimes used especially the socalled tar shampoos and chamomile shampoos.

When manufacturing tar shampoos one may use pine tar, which, however, shows the drawback of strong colouring. A most suitable substance is Anthrasol (1 per cent.) which has the same cosmetic properties as tar but is colourless. Its cosmetic action is antiparasitic, ceratoplastic and disinfectant. Therefore it is very suitable for washing the hair.

Chamomile shampoo derives its action from genuine chamomile oil and alcoholic chamomile extract.

CHAMOMILE SHAMPOO

Liquid shampoo soap 25% fatty acid	90	per cent.
Alcoholic chamomile extract	9	,, ,,
Chamomile oil	1	,, ,,

The so-called alkali-free shampoos are based on fatty alcohol sulphonates, which are preferably neutralized with triethanolamin.

Other cosmeticly active substances may be added, especially acids which correspond best to the acid nature of the hair. Their action is disinfectant, tonifying and astringent. Moreover acids enhance the natural gloss of the hair.

LIQUID SHAMPOO WITH TRI-LAURYL SULPHONATE

Triethanolamin lauryl sulphonate	45	per cent.
Boric acid	3	,, ,,
Citric acid	2	,, ,,
Distilled water	50	,, ,,

TAR SHAMPOO WITH TRI-LAURYL SULPHONATE

Triethanolamin lauryl sulphonate	48	per cent.
Anthrasol	3	,, ,,
Distilled water	49	,, ,,

The Sapamines also allow interesting combinations in liquid shampoos in acid medium. In these preparations alkaline substances should also be avoided because they diminish the action whereas acid additions improve the action.

SAPAMINE-SHAMPOO

Sapamine salicylate	8	per cent.
Sapamine phosphate	12	,, ,,
Citric acid	0.5	,, ,,
Salicylic acid	0.5	,, ,,
Boric acid	0.5	,, ,,
Perfume	0.5	,, ,,
Distilled water	78	,, ,,

Some people use so-called dry shampoos, the action of which is purely physical degreasing. These shampoo powders should have a very loose condition because it should be possible to remove them by brushing and therefore they may not stick to the hair and the scalp.

Generally they are combinations of mild alkalis with degreasing starch (rice starch) kaolin suspensif, orris root powder, etc.

The manufacture is a simple mixing of dry substances, with ultimate sifting.

DRY SHAMPOOS

Rice starch	40	per cent.
Kaolin suspensif	30	,, ,,
Orris root powder	20	,, ,,
Borax	5	,, ,,
Sodium bicarbonate	5	,, ,,

LOTIONS

These are the most important and most commonly used cosmetics for the hair. Their action is mainly preventive, seldom healing, especially not in serious cases of alopecia, which are usually caused by some internal malady. On the other hand, lotions may be very suitable in cases of Seborrhoe and may also completely eliminate dandruff. By mild irritation the scalp is favourably influenced, also by a light massage. Owing to the alcohol content which in most good lotions is 50 to 60 per cent. and which has an agreeable cooling action, good cleansing and degreasing is obtained. Lotion may contain cosmeticly active substances, but always in small amounts.

Alkaline additions, which will improve foaming property and the degreasing action, should preferably be omitted although they are often recommended in literature. When constantly used, they do not go well with the acid nature of the hair. Likewise glycerine should be completely omitted because it makes the hair sticky and counteracts the cleaning of the hair.

Lotions are generally perfumed with 0.5 per cent to 1 per cent. The perfume should not contain any raw materials which may irritate the skin. Before using them perfume essences should be well tested with the other ingreditnts of the lotion because discolouration may occur and the perfume or the cosmetic additions may be destroyed by chemical reaction.

From lotions several actions are expected. Every lotion contains alcohol which is the proper tonic. In most cases, ethyl alcohol is used which somethimes is replaced by isopropyl alcohol. Hair lotions contaaining more than 70 per cent. of alcohol have an excessive degreasing action and when constantly used they may cause dandruff. In most cases 50 to 60 per cent. of alcohol is sufficient.

Irritating substances may assist the scalp in its physiological function but they should be used cautiously because excessive proportions of such substances might lead to inflammation of the skin.

Arnica (an alcoholic extract of Arnica blossoms 1:100) ,has a good cosmetic action and in small concentration it is mildly irritant and antiseptic.

Pilocarpine: an alcaloid, is generally used in lotions as a salicylate.

In concentrated form it is toxic; therefore it should not be used with more than 1 per cent in hair lotions.

Antiseptics are used in a good many scalp lotions against the parasitic maladies of the scalp. Good antiseptic action may be expected from the following:—

Thymol and chlorothymol: to be used cautiously in small amounts (toxicity and strong smell).

Boric acid is antiseptic and astringent and reduces the irritation. Its pH is considerably strengthened by the addition of other acids (citric acid, tartaric acid).

Boric acid is antiseptic and astringent and reducts the irritation. Its pH is considerably strengthened by the addition of other acids (citric acid, tartaric acid).

Salicylic acid is an antiseptic and easily soluble in alcoholic lotions.

It should be used in low concentration (ceratoplastic action) because concentrated lotions have an ceratolytic action.

Some essential oils have a antiseptic action. Others are not suitable because of their odour.

Tonic and astringent substances may have a favourable influence on the scalp.

One may use successfully:—

Extracts of Cinchona bark and quinine salts. The concentration should not be excessive. In low concentration these substances have an antiparasitic, tonifying and antiseptic action.

Cinchona-bark from Cortex Chinae. obtained by extraction from one part of powdered bark with 5 parts of alcohol 60 per cent. The alkaloid content of the bark is often different: on an average it is about 2 per cent. calculated as quinine sulphate.

In the form of quinine salts the following substances are used:—

Quinine formate (O_{20} H_{24} N_2 O_2) is a water soluble powder with more than 80 per cent. quinine content.

Tannoquinine (Chininum Tannicum) is excellent for the treatment of falling hair. This yellowish amorphous powder is soluble in 50 to 60 parts of cold alcohol or in 50 to 60 parts of hot water. Quinine oleate, quinine ricinoleate and quinine stearate may also be used to good purpose in cases of alopecy.

Several birch-products seem to have hair growth promoting properties.

Birch juice is interesting. In pure condition it is subject to fermentation and therefore it should be preserved with benzoic acid or its esters, salicylic acid, etc. Alcohol has also a preserving action so that a hair lotion, containing 50 per cent. of birch juice and 50 per cent. of alcohol appears to be sufficiently conserved.

Birch bark extract from Corex Betulae albae contains apart from Tannine a hair-growth promoting glycocide: Betuline.

Hamamelis extracts from Folia Hamamelidis and Cortex Hamamelidis are also suitable in lotions. Their function is based on the activity of the tannine and of the resinoid hamameline and they have an astringent and tonic action.

Of interest for lotions are two combinations of chloralhydrate:—

Captol (chloralhydrate + Tannine) which is used in 1 or 2 per cent. concentration for the treatment of Seborrhoe, and

Chloralquinine (from chloralhydrate and quinine) which is used for the same purpose.

The above are the most important substances which may be used in lotions. There are still other suitable substances such as the various tars: birch tar (Oleum Rusci), pine tar (Pix Liquida), beach tar (Oleum Fagi) which have an excellent antiparasitic and antieczematic action on the scalp owing to their content of phenol, cresol, creosote and guyacol. All combinations of these tars such as Pixol Pitylene are of interest for hair cosmetics.

The manufacturing process is similar to that of Eau de Cologne and based on a solution and a thorough mixture of all ingredients. Filtration, if possible cold, over magnesia or asbestos is indispensable.

This method of cold filtration is indispensable in order to obtain a crystal clear product which will not become turbid afterwards.

Often foaming capacity is required from lotions. This is obtained by a suitable proportion of alcohol and water (minimum 50 per cent. alchol).

It is advisable not to use alkaline additives such as sodium bicarbonate, potassium carbonate, etc. Akalinity may lead to destruction of the perfume and discolouration of the lotion. Additions of Saponine and soap are also rather problematic.

Bay rum is only hair water which uses a mild alkaline borax. In the better qualities no borax is included.

HAIR LOTIONS AND BRILLIANTINES

As hair oils serve the purpose of oiling the hair and also of fixing it, a differentiation between hair oils and liquid brilliantines, as mentioned in the professional literature, does not make any sense because coloured and perfumed paraffin oil and jelly form the main base for both types of products.

The manufacture of liquid brilliantines and hair oils is not complicated. A hair oil should be crystal clear and should not become turbid when cold. Therefore filtration should occur where cold to obtain good crystal clear transparency, and a suit-

able perfume essence is necessary. Generally perfumes dissolve well in vegetable oils but not so easily in petroleum jelly. Essence manufacturers will be able to offer special compounds for such purposes.

Most hair oils are coloured green, yellow, red or brown. Generally fat soluble colours are used, also chlorophyll for green, saffron tincture for yellow and alkalin for reddish tints.

Vegetable oils should only be used when suitably preserved. They are subject to oxydation when in contact with the air and should be preserved with esters of p-oxybenzoic acid. Only best qualities of oil, duly refined and freed from acid should be used. Other suitable preservatives are resinoids of peru and Tolu balsams.

As they are isolated by extraction of the drug with petroleum ether they still contain wax and resin substances of the drug: they are therefore rather sticky and for conservation purposes they should only be used with 1 per cent. in hair oil.

If the hair oil is not only used for fixing the hair but also for oiling the scalp, its action may be improved by several additions such as quinine salts, vitamin preparations.

GENUINE NUT OIL

Olive oil	1000	per cent.
Nutshells green and fresh	100	„ „

Digerate on the waterbath.

Generally nut oil is artificially obtained from petroleum jelly by suitable colouration and perfumed with Geranium oil.

Just like nut oil, other oils such as oil obtained from Radix Bardanae and Makassar oil may be obtained artificially.

ARTIFICIAL MAKASSAR OIL

Petroleum jelly	1000	per cent
Olive oil	1000	„
Bitter almond oil	1	per cent.
Vanillin	0.8	„ „
Ylang-Ylang oil	0.5	„ „
Heliotropine	0.2	„ „

Original Makassar oil has a mild almond smell, which must be accounted for when perfuming.

Liquid hair fixatives are mostly offered under the name of liquid brilliantines.

Liquid Brilliantines are:—

(a) Pure mineral oil (paraffin oil) or vegetable oil.

(b) Alcoholic castor oil solutions (homogen).

(c) Double layer brilliantines (non homogeneous oil-water mixtures).

Alcoholic castor oil briliantines contain up to 50 per cent castor-oil, diluted in 96 per cent. alcohol. If necessary these are slightly coloured and they are perfumed (heliotrope, violet, lilac). This kind of brilliantines belongs to the best sorts and has cosmetic value. A condition is that only medicinal castor oil should be used.

DOUBLE LAYER BRILLIANTINES

Consist of two layers: the oil layer (mineral oil or olive oil) and the perfumed alcoholic layer. The oily layer may not be alcohol soluble, because both layers should be sharply separated in the bottle and they should only mix if shaken before use. This emulsion however is so unstable, that it separates again immediately after use.

In order to stress the separation by colour contrast, the oil is coloured yellow, and the alcoholic layer according to the perfume, green, lilac, pink, etc.

Manufacturing these brilliantines simply consists of fiilling suitable small bottles with the oil and the extract 90 per cent. alcohol. Pure oil brilliantines are perfumed with maximum 0.5 per cent. Brilliantines perfumed with more than 1 per cent. have too strong a fragrance

because on the hair it works too intensively.

SOLID BRILLIANTINES AND HAIR POMADES

Both serve the purpose of fixing the hair and oiling it and also to give it a good gloss. The basic material for solid brilliantines or crystallized brilliantines generally is vaseline. The consistency is regulated according to the climate with paraffin oil, spermaceti, ceresine, rosin, etc. Crystallized brilliantines have been superseded by a transparent brilliantine. Solid brilliantines are generally coloured yellow, green or reddish. Oil soluble colours are generally used with the proportion of perfume 0.5 per cent. to 1 per cent. on an average.

RAW MATERIALS FOR SOLID BRILLIANTINES

Stearin	—	—	200	—
White petroleum jelly	600	280	50	400
Paraffin oil	130	500	700	400
Clear rosin	150	—	—	100
White astrolatum	—	100	—	—
Spermaceti	—	120	—	—
Lanolic	120	—	50	100

Spermaceti often leaves pellicles in the air and it is advisable to replace it by stearin or ceresin.

HAIR POMADES

These are no longer modern and they are often replaced by solid brilliantines. The finest pomades are obtained from genuine pomades enfleurees whereas sticks are made from tallow or similar products with a high melting point. All fats, with the exception of mineral oils, should be carefully preserved. To-day cosmetic additions are not found in pomades: pomade diaphane based on soap is no longer to be had.

BASIC MATERIALS FOR STICK BASE

(1)	Tallow	500	parts.
	Ceresin	150	„
	Cacao butter	300	„
	Beeswax	50	„
(2)	White petroleum jelly	500	parts.
	Paraffin	50	„
	Ceresin	150	„
	Lard	250	„
	Olive oil	50	„

Perfumed with 0.3 to 1 per cent. The consistency is regulated according to the climate. Saponification substances should be well preserved.

HAIR FIXATIVES

They are characterized by the absence of fats and there are three kinds of them:—

(1) Liquid (bandoline).
(2) Creams (in tubes).
(3) Hair lacquers.

The first two types are based on mucilages as these are prone to fermentation. Preserving substances such as Oxybenzoate or salicylic acid are indispensable.

For the mucilage the following are suitable: carraghen moss, karaya gum, tragacanth, pectines, alginates, etc. Liquid fixatives are also used for water wave.

LIQUID FIXATIVES

(1)	Lemon pentine	3	per cent.
	Glycerin	3	„ „
	Alcohol	1	„ „
	Citric acid	0.5	„ „
	Distilled water	92.5	„ „
(2)	Tragacanth in powder	0.2	per cent.
	Alcohol	2	„ „
	Glycerin	3	„ „
	Distilled water	94.8	„ „

For these, the percentage of mucilage is simply increased, so that their consistency increases.

(1)	Tragacanth in powder	4.5	per cent.
	Gum arabic	0.5	,, ,,
	Glycerin	5	,, ,,
	Alcohol	5	,, ,,
	Distilled water	85	,, ,,
(2)	Gelatin	3	per cent.
	Agar-agar	0.5	,, ,,
	Gum arabic	0.2	,, ,,
	Distilled water	96.3	,, ,,

It is recommended that the preservation substances be dissolved in the alcohol which then should be added into the mass.

HAIR LACQUERS

These should be easily removed from the hair by simply shampooing. Simple alcoholic rosin solutions (shellac) are not suitable because they stick to the hair and cannot be removed easily. Shellac is made water soluble by mild alkalis (triethanolamine, borax), so that removing it from the hair does not give any trouble.

HAIR LACQUER

Shellac (natural orange)	8	per cent.
Triethanolamine	1.5	,, ,,
Alcohol	20	,, ,,
Distilled water	70.5	,, ,,

ALCHIMIST

Hydrological Research in the Development of Inland Fisheries of India

BY R. SRINIVASAN, M.A.

't is needless to emphasise the importance of the development of fisheries resources f our country, especially in these days of ood scarcity. Besides the potentialities of ur rich marine fisheries, there are conderable possibilities for developing our nland fisheries resources which are of a iverse character consisting of innumerble backwaters, rivers, artificial reservoirs, atural lakes irrigation tanks, canals and wamps distributed all over the country. ut, for the proper development of the land fisheries we must have a sound nowledge of the ecology of all these aters and its influence on the fishes in abiting them. Thus the study of the hysics and chemistry of the various nland waters constitutes an important ranch of fisheries research: and an attempt s made in this article to elucidate the ature and scope of such hydrological research in creasing fish production from the inland waters.

LIMNOLOGICAL AND RHEOLOGICAL STUDIES

Our knowledge of the physics and chemistry of lakes, reservoirs and streams of the tropics especially of India, is very limited. For any real improvement of the inland fisheries of the country, steps should be taken to gather fundamental limnological data of these waters, for such a comparative study would furnish (a) reasons for the abundance of fish in certain waters, (b) conditions favourable for a a given species of fish, (c) environmental factors limiting fish crop and (d) improvements that are necessary for increasing their fisheries. The phenomenon of thermal stratification and of the vertical distribution of oxygen, pH, and other physico-chemical variables at different times of the

year are factors of greatest significance and influence that they form directly or indirectly the structure upon which the whole biological frame work rests. The study of such limnological factors will also reveal those portions of lakes unsuited for fish life, so that one can know the consequent movement of deep water fishes to shallow waters—an information which is essential for fishing operations in deep waters. Thus the main aspect of hydrological research is to survey the various inland water resources to ascertain their suitability for pisciculture and to assess their natural productive capacity.

AQUATIC MANURING

Hydrological research aims at increasing the fertility of waters by manuring, since the tonage of fish output depends primarily upon the biological productivity of the enviornment. While hydrobiological changes cannot be easily effected in the open sea, the productivity of inland waters can be enhanced severalfold by proper investigation and fertility treatment. The problem of evolving methods of such treatment particularly suitable to tropical and Indian conditions especially by making use of cheap organic and inorganic manures is of much economic importance at the present time of food shortage. Ganapati (1948) has described the method of application of some of the organic and inorganic manures that may be tried for increasing the basic fertility of the aquatic soil. The use of sewage for fertilizing fish ponds has been advocated by Ganapati and Chacko (1950) who have even made out a case for the opening of a fish farm for the utilization of effluents of the sewage irrigated agricultural farm belonging to the Madurai municipality.

FACTORS INFLUENCING SPAWNING OF INDIAN CARPS

An important problem which hydrological research may be expected to solve is regarding the spawning of the Indian carps like *Catla catla, Cirrhina mrigala, Labeo rohita, Labeo fimbriatus*, etc., which contribute to the major fisheries of our inland waters. These fishes have not been so far observed to breed in confined waters and the factors influencing their spawning still remain a mystery, even though various views have been expressed. Hora (1945) observed that a "heavy monsoon flood is the primary factor that influences the spawning of Indian carps and that other topographical, chemical and physical changes in the environment of the fish are entirely dependent on it. All these changes are linked together as cause and effect so that some sort of a combination of all will be necessary before the fish could be induced to spawn." But Ganapati and Alikunhi (1950) feel that the availability of suitable spawning grounds is the most important factor that decides spawning of carps in India. So, in the absence of any precise information regarding the factors inducing the breeding of the carps, detailed hydrobiological studies in rivers, prior to, during and after spawning of the carps must be made and similar conditions must be reproduced in the confined water to determine the peculiar factors favouring carp spawning. Any success in this attempt would help to solve the problem of fish-seed supply for stocking the innumerable cultivable pieces of inland waters of our country.

IMPROVEMENTS OF THE METHODS OF TRANSPORT OF LIVE FISHES

Till such time as we are able to unravel the mystery surrounding the spawning of carps and to induce them to breed in confined waters, seedlings of these fishes may have to be collected from rivers and canals and transported in large numbers to the various ponds and tanks. It is with considerable difficulty that they are at present transported over long distances by rail or road. Trained personel have to accompany the consignments on the journey and they have to change the water

in the containers at frequent intervals. For transport by air over long distances, they are at present sent in oxygen tin carriers. In spite of all these precautions the percentage of mortality during transit is often high. It is therefore necessary to find more effective methods of transport. Vaas (1951) and Srinivasan and Chacko (1953) have found that the addition of a buffer like secondary sodium phosphate can reduce the mortality of fish during transport in oxygen tin carriers. As indicated by Basu (1951) precise knowledge of the physiological requirements of eggs, larvae and fries of the fishes during transportation may also be helpful in designing suitable carriers and in evolving successful methods of transport.

PREVENTION OF LARGE SCALE FISH MORTALITIES

Besides the loss of fingerlings of fishes during transport, sudden and large scale mortalities of fish often occur in many ponds and tanks, inflicting heavy losses on the fishery resources. So the problem of finding out the exact causes of such fish disasters and averting their recurrence is of immediate practical importance. A careful study of a number of cases of fish mortalities by the author shows that death of fish was almost always due to asphyxiation caused either by chocking of gills of the fish with planktonic organisms or mud or by a fatal deficiency of dissolved oxygen associated with increased carbon-dioxide content. In some cases overwhelming growths of algae and other vegetation were found to diplete the oxygen in water and thus caused large scale fish mortality especially during night and early morning hours when the liberation of oxygen by photosynthesis is temporarily suspended. Such instances of mortality may be prevented by controlling the growth of vegetation in the tanks.

CONTROL OF AQUATIC VEGETATION

Besides being responsible for causing sudden and large scale mortalities of fish as explained already the wild growths of submerged and emergent plant life often lead to overpopulation of stunted fish and reduction in the fish crop. Further, the dense growths of such plants hinder the operation of fishing nets. The eradication of the unwanted vegetation in fish ponds is therefore necessary for the healthy development of fish life. The various methods in vogue for the control of aquatic vegetation are recounted by Srinivasan and Chacko (1952), who have also found 'Dicotox'—a M & B formulation containing the ethyl ester of 2, 4-D (2, 4 Dichlorophenoxy acetic acid) which is a plant growth regulating substance, to be useful in killing submerged weeds like *Hydrilla verticellata* and *Vallisineria spiralis* which grow dense in many fish ponds of Madras State. Further work is necessary in this subject to find cheaper and more effective methods of control of not only weeds but also of the growth of algae. The latter frequently forms bloom especially in temple tanks, causing nuisance and occasional large scale fish mortalities

POLLUTION OF INLAND WATER

The pollution of inland waters by factory wastes and effluents also seriously jeopardises the country's fisheries wealth. Various industries like chemical works, paper mills, sewage works, sugar factories, etc., discharge their wastes into nearby streams as an easy and economic method of disposal; but such indiscriminate means of disposal cause considerable nuisance in the natural waters and also damage their fisheries. Though the discharge of some substance of biological significance into the waters may increase their fertility, it is not always advantageous to do so, as certain standards of purity have to be maintained in them for sustenance of commercial fisheries and other biota. The studies already made by Hora (1942), Ganapati and Alikunhi (1950), and Ganapati and

Chacko (1951) clearly show the extent of damage that may be done to the fluvial fisheries of our country by obnoxious trade effluents, and stress the need for similar investigations for effecting disposal of the waste waters in a way not injurious to the fish population.

ACCLIMATISATIOIN OF FISH

Another important aspect of hydrological research is the acclimatisation of salt water fishes to freshwater conditions in the shortest possible time and with the least mortality. Job and Chacko (1947) have briefly indicated the prevalent practices in Madras of acclimatisation of saltwater fish seed to fresh water: and Ganapati (1949), Ganapati et al (1950) and Ganapathi and Alikunhi (1952) have elucidated their hydrological details. It would appear that in the early post-larvel stages most of the economically important coastal food fishes such as the *Mugil cephalus, Megalops cyprinoides, Elops indicus, Gerres filamentosus, Scataphagus argus, Sillago sihlama, Hemiramphus gaimardi* and *Ambasis commersonii*, possess the capacity for quick adaptation to wide and sudden fluctuations in salinity and other environmental conditions; but that advanced stages (2" to 3" long) particularly of Megalops and Elops are found to be more susceptible to such environmental changes. In the case of *Chanos chanos*, however, young ones varying from half to several inches in length seem to stand direct transference to fresh water without any visible signs of distress. The knowledge that these important saltwater fish seeds, at this early stage can withstand even direct transference from brackish to freshwater has a vital bearing on the possibilities of their successful culture in inland waters. Besides the saltwater fishes, coldwater fishes like Mirroor carp (*Cyprinus carpio*), Golden carp (*Carassius carassius*) and Tench (*Tinca tinca*) have also been acclimatised to the warm conditions of the waters of the tropical plain. Thus hydrological research aims in increasing variety to the bulk of the inland food fishes of our country.

BOTTOM MUDS AND AQUATIC PRODUCTIVITY

The hydrological study is extended to an examination of the physical and chemical composition of the bottom muds of the inland waters which are intimately concerned with bilogical productivity. The bottom soils form the reservoir of nutrient salts necessary for the planktonic algae which represent the first link in the food chain of a lake. According to Mortimer (1942) two categories of knowledge are required to describe the physico-chemical aspect of organic production in lakes, "first, of the physical and chemical variables which limit plant growth in any specified set of conditions, and second, of the factors controlling the rate of supply of nutrient elements to surface illuminated waters." The second category of knowledge can be obtained by studies of bottom muds which will throw light on (a) the physical and chemical composition of bottom muds, (b) the exchange of dissolved substances between mud and water in the different types of inland waters and (c) the mechanisms involved in the apparent release of plant nutrients to the water. The chemical analysis of muds will also show whether a soil is unusually low or is well supplied with available nutrients and indicate what plan of fertilization or other soil treatment is likely to be profitable. The identification and estimation of the decomposition products of bottom deposits and the study of their changes with temperature and other changing conditions may also give an insight into the causes for sudden and large-scale mortalities of the fish in ponds and lakes. There is a great need for a critical study and satisfactory classification of the bottom muds, which may even enable us to find an index of lake productivity.

—IND.-COM. JOURNAL

AGRICULTURAL TIPS

CULTIVATION OF CHILLIES IN BOMBAY

The Chili plant belongs to the same class to which brinjals, potato or tobacco belong. These plants in general are very liable to suffer from ary excess of water in the soil. They also flourish with a liberal supply of Potash in their food. Chillies cannot stand any degree of cold specially in their early stages. The use of this plant lies in its pods generally ripe and not infrequently green furnishing a pungent material in the culinary. Chillies are grown all over the Bombay presidency. However, the Dharwar District stands first, occupying as it does over two-fifths of the total area in the Presidency proper: Belgaum stands next, Satara and Poona being the more important ones amongst the rest.

SOILS AND THEIR PREPARATION

This crop grows on a variety of soils barring those that are salty. As in the Southern Maratha Country and parts of the Karnatak it is grown as a dry crop on fairly deep black retentive soils, provided the rainfall in the Kharif and Rabi seasons is fairly well distributed. In other parts where the winter rainfall is meagre, the crop is usually required to be irrigated from October onwards or from the beginning if the rain in Kharif season is insufficient or untimely. When grown as an irrigated crop, generally medium types of soil, usually well drained, should be selected. The land should be well ploughed seven to eight inches deep, clods crushed and the soil brought into a fine tilth by subsequent harrowings as usual.

MANURING

Either before or immediately after ploughing has been done 15-20 cart-loads (one cart-load equal to about 800-900 lbs.) of well rotten farm vard manure or town sweepings or poudrette should be uniformly spread over and thoroughly worked into the soil. If the manure is applied after ploughing, it is better to use a tinned implement like the local Phan in place of an ordinary blade harrow for mixing the manure.

RAISING OF SEEDLINGS

While the soil is being prepared, raise the seedlings in a nursery. To get a good stand of seedlings, it is better to select a higher lying portion of the field in close proximity to the supply of water. Beds, preferably raised above ground, should be made and the soil in these beds should be dug and fined down. The size of each bed should be about 6 feet long, three feet broad and nine inches high. The seed beds should receive manure at the rate of about a basketful (about 20 lbs.) of farm yard manure for each bed of the above size. About 10-12 beds of the above size are usually sufficient to take about one pound of seed which will give enough seedlings for an acre. In most places, except such as have very heavy rainfall like in the Konkan, the seeds should be sown, preferably by the middle of May, so that the seedlings will be ready for transplanting by the middle or end of June. The seeds should be sown either broadcast or in lines 4-5 inches apart and covered with soil. The line sown seedlings would facilitate weeding. After sowing it should be lightly watered with watering cans morning and evening, for a week, after which flow irrigation may be resorted to as required in the side channels, so that the water would easily and fully soak through the soil of the bed. For a week after sowing it is better to spread some grass or thin light stalks of cotton, etc., to afford some cover to prevent the surface soil from drying too quickly. The seed-

lings will be ready for planting out in about 4-6 weeks by which time they will attain a height of 6-8 inches.

TRANSPLANTING

On the night previous to planting the seedling beds should be thoroughly soaked with water to facilitate uprooting of the seedlings. The seedlings should be uprooted and carried to the field, care being taken not to expose them too long to the sun's heat. For planting a cloudy and drizzly day is the best. A hole should be made by a peg or some such tool at the spot where the plant is to be put in. One or two seedlings should be planted in each hole and the soil pressed firmly round the plant. It is important to press the soil round the plant as it ensures a good stand. If the land has been laid into ridges, the plant should be set out on one side and about the middle of the slope of the ridge. The distance between the plants varies from 18 to 36 inches according to the richness of the soil as well as the expanse of the variety.

If, however, the crop is to be grown under irrigation from the start it is better to lay out the land into long ridges and furrows, the length depending upon the slope of the land. If the land is too coarse and light bed system may be found necessary.

AFTER-CARE

The after care mainly consists of:—

(a) Inter-cultivation—The chilli plant is generally benefited by stirring of the soil. In a dry crop this is best done with hoes (Kolpas), bladed if the land is weedy and toothed if the land is clean. This inter-tillage should be repeated as often as may be necessary to keep the weeds down or to renew the destroyed mulch. No tillage of the soil is possible after the plants begin to flower profusely. Just before such a condition arrives, a last stirring to a depth of about 4 inches should be given with preferably a toothed hoe.

(b) Irrigation if necessary.—Irrigation should be given with caution, i.e. only when absolutely necessary. As a rule, unless there are signs of wilting no irrigation is to be given. If the crop has been planted on flat land and irrigation is to be given later in October or November, the land between the lines should be broken with a plough or ridger and ridges and furrows prepared in August, i.e., before the plants begin to flower. Usually irrigation will be required only in 10-20 days according to the retentive nature of the soil. Plants may also be earthed up if they are likely to lodge.

HARVESTING

About three months after planting harvesting would generally begin. Care should be taken to pick up the pods as they ripen. If any unripe chillies come in the harvest, they should be separated out and not allowed to dry along with ripe ones. Unripe pods turn white in drying thus spoiling the appearance of the whole lot in the market.

The pods, after picking, should be spread on clean, dry and hard ground and allowed to dry in the open for about 8—10 days, collected and stored for marketing whenever required. About 3—5 pickings in a dry crop and a few more when irrigated are obtained.

A dry crop would yield about 700 to 1000 lbs. of dry chillies per acre while an irrigated crop would give 1400 to 2000 lbs. The market rate for dry chillies varies according to quality. The labour units in days for an acre crop of chillies partly, on rainfall and partly on well irrigation are generally 40 men. 75 women and 45 bullocks. The out-of-pocket expenses for material would be about Rs. 75.

AGRICULTURAL OPERATIONS FOR FEBRUARY

FOR THE PLAINS

Vegetables: — Little can be done during this month in the cultivation of european vegetables, except copiously watering those that are already in ground

Sowings of Lettuce, Mustard, and Cress may still be made.

To Peas that are reserved for seed, less water, if any, should be given as they ripen.

Fruits — Water loquats liberally as well as Peach, Plum, Liches and Mango, trees, as soon as the fruit it set.

Earth up and water Pine-Apples.
Fertilise Vanilla flowers.
Sow seed of water melon.

Ornamental Plants.—This is the best season for transferring such Orchids as required to new pots or baskets.

Hoyas will be started into growth, and should either have the soil in the old pots partially changed or be potted afresh: they will now bear dividing so as to make several plants out of one.

Re-pot od re-plant Caladiums, Arum pictum, Manettia cordifolia, Cyrtopera flava, Hibiscus Jerroldianus, Glorissa superba and all such like plants, that have been lying dormant during the cold season as well as the several species of Crinum, Globba, Pancratinum, Alpini, Hedychium, Hippeastrum and kaempferia.

Put in the border Petunias, Phloxes, Salpiglossia.

Sow seeds of Poinciana, Tecoma, etc. Put off the choice kinds of roses raised from cuttings laid down in November and keep them in the shade well watered.

Roses now may be layered with success

FOR THE HILLS

Vegetables:—During this month the heaviest falls of snow occur generally; but this should not beter the careful gardener from making preparations for the swoing of early vegetables in pots pans, boxes, and glazed frames having bottom heat. By bottom heat is meant a hot bed, into which the pots and pans must be plunged up to the rim. Seeds of Carrots, Turnips, Lettuce, Cabbage, Cauliflower, Spinach, Endiye, Asparagus, Radish and Cress should be sown if there are no frame, then the pots, pans and boxes must be kept in the green house or stove.

Fruits:—About the end of this month the fruit trees will begin to show signs of reviving life. The roots should be cleared of all rubbish and preparations made to open the soil round them. This should not however be done unless there is a prospect of the snowfall ceasing. If the season promises to be an early one. Apple, Pear, Apricot and Plum trees should be pruned about the end of this month and manured. Straw-berry beds should now be prepared and the suckers transplanted.

Flowers:—In the flower garden the busy time will begin about the end of this month. Sowings of English Annuals should now be made in pots and pans especially Caleceolaria Cineraria, Heart sease, Aster and Larkspur as these take longer to develop than others. If it has ceased snowing, Roses, Geraniums, and Fuchsias should be pruned and the cuttings put down in sand in the propagating frame. This is the best time to re-pot Geraniums and Fuchaias, and Roses in pots. The beds and borders out of doors should now be looked to, and cleared of all rubbish, and the soil up and got ready for planting.

Scientific Researches & Inventions

SOUND KILLS GERMS

High-pitched sound waves kill germs so effectively that they can be used to purify water and sterilize milk. This is the finding of Miss Lillian A. Russell of the Illinois State Water Supply. The sounds used are ultrasounds of high intensity and of a million vibrations per second. Ultrasound is made by vibrating a quartz crystal in a high frequency electrical field. Prof. Cecil G. Dunn of the Massachusetts Institute of Technology has reported that waste from atomic furnaces can be used to purify water and sewage by treating them with radiations.

PLASTIC GULLET

A plastic tube as a substitute for the human gullet (down which food passes to the stomach) has been developed. Dr. Edgar F. Berman of Baltimore reported on 30 cases. Of these, 28 patients had cancer of the esophagus. The cancerous portion was removed and a plastic tube, four to nine inches long, inserted. "The comfort of the patients has tremendously improved," the doctor stated.

BLOOD PRESSURE DRUGS

A new approach to controlling high blood pressure shows promise, according to two doctors of the Rockefeller Institute for Medical Research, New York. The drugs, in pill forms, include alkyl nitroindoles. The safety and effectiveness of these have been tested on laboratory animals. The new chemical was developed by changing the chemical structure of serotonin. Serotonin constricts . blood pressure of normal animals. It is not found in normal blood.

WATERPROOFING DYES

Dyes that both colour fabrics and make them water-repellent have been developed by an American chemical society. The new dyes may make clothes and other wool and cotton articles more durable since they lubricate the fabric and keep moisture out.

SEEDLESS TOMATOES

Seedless tomatoes have been grown in weedless gardens by using a changed form of the weed killer known as 2,4-D. U. S. Department of Agriculture chemists have reported. Ordinary 2,4-D harms tomato plants. But by combining, known as 9-amino acids, the new formula increases the size of tomatoes. But experiments have been made only under controlled greenhouse conditions. Field tests are necessary before the results can be applied commercially.

NEW X-RAY

Mass fluorography of the head and abdomen to detect disease, including stomach cancer, is promised by an X-ray machine being tested at University of Chicago. The machine uses the light-gathering characteristics of the Schmidt astronomical camera to take fluoroscopic pictures of dense areas of the body.

REIMPLANT LUNG

Three surgeons of Philadelphia, Pennsylvania, Drs. Wilford B. Neptune, Hector Redondo and Charles P. Bailey, have succeeded in reimplanting a lung in a dog. They removed it first from the animal's body and then grafted it back. The dog is alive and well one year after the operations and the reimplanted lung is apparently normal. This strengthens the

belief that a diseased lung or other organ of the human body may be replaced with a healthy one.

COTTON MATURITY TEST

A new and quicker way of measuring the maturity and fineness of cotton fibre has been developed by the U. S. Department of Agriculture. The readings are taken on a Micronaire. The method is named "Causticaire" because of the strong caustic used in the process. The rate of flow of air through the fibre indicates its fineness and maturity.

STOMACH ELECTRICITY FIGHTS DISEASE

Electrical impulses generated by the human stomach are being studied as an aid in the diagnosis of various ailments. According to SIS Press Service, two Canadian scientists report the use of a device, called the electrogastrograph, for this purpose. A normal stomach, they say, generates a regular electrical impulse of a particular intensity about once every 20 seconds. A diseased stomach may generate impulses at irregular intervals, and the impulses may have three or four times as high a voltage as normal. As the impulses characteristics of each stomach diseases are determined and registered, the electrogastrograph may become as important a practical help as is the electrocardiograph in the study of the action of the heart.

NEW X-RAY PROCESS

According to a U. S. I. S. report, Dr. George H. Ramsay, professor of radiology at the University of Rochester, recently demonstrated a new three-dimensional X-ray process at the Seventh International Congress of Radiology in Copenhagen.

CRIPPLED CHILD

Children become disabled from polio, arthritis and cerebral palsy. They lose the control of their limbs and in many cases they cannot speak articulately, however intellectually they are normal. If given proper treatment the majority of such unfortunate children may recover. According to Dr. Kenji Tegaki, who is in charge of a unique institution in Japan known as Sheishi-Ryogo-En (Institution for Crippled children), medical treatment should be given, when children are small. Children must, however, have the will to walk and when they are four it is the right time to start medical treatment. It is not effective to work with children much younger than four. Again if left till they are fifteen years old or so, there is little that medical care can do for them. It is therefore desirable, says Dr. Takagi, that parents who unfortunately have crippled children should think of the future of their children and start treatment at the proper time. Early treatment gives hope of recovery to majority of cases.

BRAIN-WAVE TESTS

A campaign has begun to oblige boxers to take brain-wave tests before they are permitted to fight. This follows a series of scientific tests which suggest that the word "punch-drunk" may not be far from the truth. The State of Colorado became concerned about possible injuries to professional boxers a year or two ago, and ruled that each fighter must have a special medical examination once a year. The examination includes a study of the electrical waves which oscillate continually in the brain and can be registered and recorded on a special machine called the "electroencephalógraph." Typical kinds of disturbance in the patterns of these waves may reveal specific brain injury. According to SIS Medical Features in the tests, nine out of twenty-four professional boxers studied turned out to have abnormal brainwaves. Serious disturbances were most common among boxers who had been knocked out at least once.

Engineering Notes

A NEW MACHINE FOR ROTARY BLADE

Daniel Smith Limited, have, for upwards of a century, been pioneers in the cold rolling and forming of metal sections. In response to a demand for improved methods of production for the large quantities required in the domestic lawnmower industry, they have produced a new machine which has a wide application of uses.

The new machine can, for example, roll from the flat strip a high carbon steel into a rotatry blade by first forming the profiles, or section and cambering and helixing to any desired pitch of helix and diameter of drum or rotary frame to which they are intended to be fitted.

Another form of rotary blade which the machine produces with suitable tooling is the form of the hot rolled chamfered blade sections, again to give the correct cambering and helixing.

The machine will accommodate up to 5/32" thickness. These latter sections are fed through the machine in long lengths or from a coil and cut off appropriately as may be required.

The machine is robustly designed of cast iron construction, totally enclosed and self-contained, with multiple machine cut gear drive from fabroil pinion and 5 h.p. motor. All its main features are in high tensile steel with simplified adjustment through parallel vertical movement to the handwheels, The machine is complete with Tecalemit "One Shot" Lubrication system to all bearings.

For further particulars write to Daniel Smith Ltd., Raglan St., Wolverhampton, England.

ELECTRONICALLY-OPERATED CAR

In experiments looking toward automatic driving over long distances, the Radio Corporation of America has developed an electronically operated car. It is devised to travel automatically over a specially wired highway. The experimental car can steer itself along a prescribed route, stop when approaching an obstruction, and turn out of its original lane into a second one to pass a slower vehicle. The model car is guided by a series of wires laid on the road surface or by cables embedded in the road. One wire running the length of the primary traffic lane sets up a magnetic field to be picked up by coils on the car, one on each side of the body. When one coil receives a stronger impulse than the other, the electronic control system detects that the car is veering from its proper course and immediately steers it back, until the coil impulses are of equal strength. A transistor circuit tied in with the ground cable warns the car's guidance apparatus of obstructions ahead. Then the apparatus either stops the cars immediately or, if the obstruction is another car moving less rapidly in the same direction, automatically steers the car past the slower one. To permit this automatic passing, the highway must have two lanes for traffic in one direction. Each lane has a guidance wire, and diagonal wires at intervals connect the two parallel wires. The automatic car is shunted to the outer lane and back again to the inner one on these diagonal wires to pass a car moving more slowly.

PORTABLE ELEVATOR FOR BUILDING MATERIALS

A portable elevator for raising bricks, tiles or other similar building materials to a height of about 20 feet has been produced by a London company. Although capable of dealing with bricks at the rate of about 1,500 an hour, it is easy to dis-

mantle it into two portable sections, each light enough to be carried about the building site by two men. This low weight makes it possible to mount the elevator on scaffolding, so that two elevators in tandem can be used to raise materials to the third and fourth storeys of a building.

No bolts or pins are needed to fit the elevator, at a convenient angle, to the base unit (which comprises a 1 h. p. petrol engine, a gear unit and a clutch), attachment being made by a clip arrangement which is claimed to be very quick and simple to manipulate. The attachments between the elevator and base unit are such that the former may be operated with the discharge end at all levels between 2 ft. 6 ins. and 22 feet above the loading point; the lower limit permits the elevator to be used, if required, as a simple conveyor.

RENEWABLE HEELPIECES

Renewable leather heelpieces which wearers can fit on their shoes in a few seconds and which, it is claimed, will wear three or four times longer than ordinary heelpieces, have been introduced by a British firm. The makers state that these heelpieces cannot come off in wear, owing to the concealed springs inserted in the heel which grip the ball ends of the prongs contained in the heelpiece. Only direct finger pressure easing the prongs from the springs can remove the heelpiece. Many of the disadvantages associated with the replacement of heelpieces by nailing are also said to have been eliminated.

The heelpiece is a precision produced article. The securing parts are made of nylon plastic, with a proved strength far beyond the wearing strain to which they will be subjected. The new heel pieces are being patented throughout the world. Careful standardisation in co-operation with one of the largest heel manufacturers in Britain will enable the purchaser of a pair of renewals to fit the shoes in most countries.

NEW PROCESS RECOVERS ZINC FROM DROSS

The dross—or compound of zinc and iron—which forms at the bottom of galvanizing pots in which steel is immersed for coating may have as much as 94 per cent. of zinc combined with 6 per cent. iron; normally the zinc is wasted when the dross is withdrawn from the pots, periodically, in order to avoid damage to the coating. Now a method of recovering the zinc from the dross has been devised by the British Iron and Steel Association.

Though the technique is not yet perfected, the Association says 95 lbs. of pure zinc can be recovered from each hundredweight (112 lbs.) of dross. Its low capital cost, simplicity of installation operation and dismantling combine to make the process attractive.

MACHINE TESTS ACCURACY OF KEYS

What is claimed to be the first machine ever manufactured to test the accuracy of newly cut keys has recently been produced by a small British engineering firm, which, for a quarter of a century, has specialised in the manufacture of key-cutting machines. Although the key-testing machine has been in production for only a few months, orders—including 50 from the United States — have been coming in from many overseas countries.

The machine enables locksmiths to check almost immediately the accuracy of cut keys to within a tolerance of 1/1,000 in. By simply slipping both the master pattern key and the cut key into the machine, all inaccuracies of the latter are shown up on a dial which magnifies the errors 10 times. The makers claim the machine has the advantages of avoiding annoyance to the customer and of saving wastage of key blanks.

STATE FARMS FOR JUTE

Eight State farms are to be established in the country for producing improved varieties of jute seed, it is learnt. This follows the recommendation of the Expert Committee appointed in March last to suggest ways of improving the quality of Indiangrown jute.

According to a Press Note issued by the Indian Central Jute Committee, the principal recommendations of the Expert Committee have been accepted by the Union Government, and a scheme has been drawn up on that basis. Three of the proposed State farms will be located in West Bengal, another three in Bihar and one each in Orissa and Uttar Pradesh. Interest-bearing loans are to be granted to the States for this purpose, and the initial losses are to be shared by the Centre and the States concerned equally.

It has been further decided to start a Centrally-financed farm under the Indian Central Jute Committee to produce a nucleus stock of seeds for distribution among the State farms. A three-year scheme has been decided upon to construct 8,200 new tanks and repair 4,300 old tanks for supplying retting water to jute-growers. The Centre has also agreed, it is learnt, to provide improved agricultural implements for distribution among he jute-growing States.

VANASPATI INDUSTRY NOT TO USE MUSTARD, LINSEED AND SESAME OILS

The Food Ministry is likely to withdraw the permission given to the vanaspati industry to use mustard, linseed and sesame oils, instead of groundnut oil in the manufacture of vanaspati. The permission was given a few months ago, owing to a partial failure of the last groundnut crop and the consequent rise in the price of groundnut oil. The position is said to be much easier now and the option to use other oils may be withdrawn when the next groundnut crop is received. Another reason for withdrawal of the permission is that the use of mustard oil by the industry is likely to raise its prices and cause hardship to people in West Bengal and Bihar.

PIG IRON PRICES INCREASED

The Government of India have decided to increase the selling prices of graded and low manganese foundry pig iron by Rs. 20 per ton. The increased price for standard foundry Grade I is Rs. 163 per ton f.o.r. main port for sales by registered producers. The prices of off-grade pig iron have also been increased but to a smaller extent. The increase in the case of off-grade pig iron varies from Rs. 10 to Rs. 12 per ton depending on the sulphur content.

The Government of India have also decided to control the distribution prices of foundry grade pig iron produced by the Mysore Iron and Steel Works, which has hitherto been outside the control. The increased selling prices referred to above will thus be applicable to the production of the Mysore Iron and Steel Works also.

The increase in the selling price has been effected in order to enable the sale of the costlier pig iron produced by the Mysore Iron and Steel Works at the same price as that of the production of the other two main producers, viz., the Tata Iron and Steel Company, and the Indian Iron and Steel Company. The selling prices, which were in force hitheto, will be treated as retention prices for the Tata Iron and Steel Company, and the Indian Iron and Steel Company. The differences between their retention price and selling price will be collected for the equalisa-

tion fund for the purpose of subsidising the production of the Mysore Iron and Steel Works to the extent of *which their cost of production exceeds the* selling price.

COMMITTEE TO REVIEW TRADE MARKS LAW

The Government of India have appointed a Committee to review the laws in India bearing upon trade marks and merchandise marks on goods and to suggest what changes and modifications are necessary particularly to ensure effective remedies against infringements. The Committee will consist of Shri K. S. Shavaksha, Registrar of Trade Marks (Chairman); and Shri Raman Bhai B. Amin and Shri P. T. Chandy, Members. Shri A. Alagiriswami will be the Secretary of the Committee.

The services of Mr. C. P. Whyman an expert from the U. K. have been obtained by the Government of India. Mr. Whyman will act as Adviser to the Committee.

The headquarters of the Committee will be at Bombay. The Committee will also visit such other places as it may consider essential for purposes of its enquiry.

ASSISTANCE TO AUTOMOBILE ANCILLARY INDUSTRIES

In addition to its inquiries into the question of granting protection and assistance to the Automobile Ancillary Industries producing leaf springs, pistons, piston rings, cylinder liners sparking plugs and diesel fuel injection equipment, the Tariff Commission has taken up the case of Hand Tyre Inflators industry also. In this connection, the Commission has prepared questionnaires for producers and consumers which are now ready for issue. Firms, associations and persons who desire their views to be considered by the Commission may obtain copies of the questionnaires relating to any of the Ancillary Industries mentioned above from the Secretary, Tariff Commission, Contractor Building, Nicol Road, Ballard Estate, Bombay 1, specifying the interest they represent.

EXTENSION OF EXPORT LICENCE

The Government of India has decided to extend the shipment validity of export licences of the items of cotton piece-goods and cotton manufactures freely licensed (other than cotton waste blankets) which were issued on or before 3rd May, 1953. till one year from the date of issue or till 30th June, 1954, whichever is earlier.

EXPORT OF SILK WASTE

The Government of India has decided to release for export a supplementary quota of 400,000 lbs. of Madras and Mysore silk waste. This is an addition to the quota of 200,000 lbs. of Madras and Mysore silk waste annuonced for export during 1953 on 16th April, 1953.

ADDITIONAL EXCISE DUTY ON SUGAR ABOLISHED

The Government of India has annouced the abolition of the additional excise duty of one rupee per maund introduced in December last under the Sugar (Temporary Additional Excise Duty) Act, 1952, cane crop of 1953-54.

This decision is a sequel to the need for preventing any increase in the price of sugar as a result of the higher price fixed for sugarcane crop for the current year than that of last year. The price of sugarcane, it will be recalled, has been fixed this year at Re. 1-5 per maund in the field and Re. 1-7 at the factory, as against Re. 1-3 and Re. 1-5, respectively, last year.

INDIAN FOUNDRY INDUSTRY

The following are extracts from the speech of Sri Manilal Atta at the second annual general meeting of the Indian Foundary Association held in Calcutta.

The industry was never before confronted with so serious problems as at present. The problem No. 1 before the foundries at present is lack of demand. Bearing this in mind, I welcome the Government decision to appoint the Engineering Capacity Committee to investigate into the idle capacity of the Engineering Industry including the Foundry Industry and to find out ways and means for utilizing it.

The reasons which have contributed to the present deterioration in the position of orders are mainly two-fold. Firstly due to general trade depression and the lack of purchasing power there is very little demand in the country. Secondly the disruption in the normal trade between India and Pakistan — especially East Pakistan, has very seriously affected the sales. The drastic fall in export to Pakistan as a whole and to Eastern Pakistan in particular, has affected the economy of West Bengal to a larger extent than the rest of India and has contributed greatly to the recent increase in unemployment.

I would make the following suggestions to help the foundry industry in the present circumstances:—

(1) Government, including the Railways, are the biggest purchasers of castings. The Government purchase policy requires revision so that it helps the foundry industry. In the first instance the Government should place bulk orders. This would give not only stability but result in economy in the cost of production. The employer will also engage extra hands with a sense of confidence whom he can train up and get returns out of them.

(2) Government factories should not be allowed to compete with private industries.

(3) At present a number of items are being imported. Import from abroad should be stopped and local foundries should be given chance to meet the country's requirement.

(4) There are a large number of items manufactured in the country which can be exported to neighbouring countries like Pakistan, Ceylon, Burma and other South East Asian Countries. The Government of India should give encouragement for export of the foundry products. For instance, whenever any trade agreement is signed between the neighbouring countries, foundry products must be included in the items of export from India.

(5) High rate of export duty imposed on many foundry products, especially 45 per cent. export duty on pipes, should be abolished to enable the foundries to compete with foreign manufacturers.

The Foundry Industry is one of the most important industries in the country. Its importance lies both in respect of direct consumer goods which it produces and also certain other goods which form components to other products. A variety of items are at present being produced in different sizes and dimensions. Castings vary from a few lbs. to many tons and from ordinary consumer goods to complicated pieces of castings requiring special designs and

specifications. There is, however, no reliable data as regards the different items that are at present being manufactured and that can be manufactured. Many of the foundries are carrying out the same stereotyped casting which they have been doing for past several years although the changed circumstances since partition require a thorough change in the whole production programme. Smaller foundries with a cupola and the traditional skill for melting the iron and producing ordinary consumer goods cannot afford to keep on their staff, trained men to carry on research for exploring the possibilities of other lines of manufacture. Similarly there are a number of foundries that have the necessary means to effect a change in the types of goods manufatured but they hesitate to take any positive steps in the absence of information as regards the scope of the new items. I, therefore, request the Government of India should make a thorough study of the existing foundries, the types of castings made, the estimated demand, the present production, the possibility of export etc. If any of the goods are being imported then information should be available regarding their estimated demand in the country and the possibilities of their manufacture in the country. Foundries should try to explore new markets and adjust their manufacturing programme in the light of the changed circumstances.

Foundry goods are heavy items. The difficulty on account of lack of markets is further accentuated by the high freight charged by the Railways and a number of restrictions imposed by them. It is, therefore, desired that special concessional rates should be given especially for long distances. It is suggested that for long distance traffic Railways should restore the concession which they previously granted. Further the foundries in West Bengal are greatly inconvenienced at the present practice of not allowing despatches of more than 20 mds. of goods from West Bengal to up-country stations in one consignment. It is a very serious restriction on the foundries which has a harmful effect in a number of ways. For instance, up-country buyers are not sure of the supplies and they do not like to receive the goods in driblets. The suppliers are also inconvenienced because even if they obtain booking after a long time it is only for 20 mds. which in case of heavy item as foundry goods, is negligible.

I would strongly suggest that the Railways should immediately withdraw these restrictions in the interest of smooth business and trade. The general shortage of wagons and other transpirt bottlenecks such as congestion at transhipment stations etc. are well-known and attention of the Railway Board is drawn towards them for removal of these difficulties.

Another serious problem with which the foundries are faced is the alarmingly high rate of pilfergae of pig iron, scrap and coke. Recently the Deputy Minister for Railways Mr. O. V. Alagesan observed in the Council of States that during 1952, the railways paid as conpensation to consignors and consignees to the tune of Rs. 304 lakhs on account of goods and parcels lost, stolen, damaged or destroyed. The Railway Minister Mr. Lal Bahadur Shastri added that the railways were seriously concerned about theft and pilferage and a high officer of the Home Ministry was going round the States to discuss with them as to how to prevent such losses.

Of the various problems confronting the foundry industry one of the most serious and certainly the most universal, is the shortage and high price of the principal raw material. While the Iron and Steel Industry does not suffer from the lack of raw material (iron ore), the relative smallness of its output embarrasses a whole series of other industries for which pig iron is the chief raw material.

Company Reports

Dauracherra Tea Company, Limited

The directors of the above Company (Secretaries: Messrs. Duncan Brothers & Co., Ltd., Calcutta) submitted the audited accounts of the Company for the year ended 31st December, 1952.

The accounts showed a profit of Rs. 1,31,470 (Rs. 11,386). On transfer of this sum to profit and loss account and after sundry adjustments, including the appropriation of Rs. 1,00,000 (*nil*) from contingencies reserve, there was a balance at credit of that account amounting to Rs. 82,047 (Rs. 45,134), of which the directors transferred Rs. 25,000 (*nil*) to revenue reserve. The directors paid a dividend of 5 (2½) per cent. and carried forward Rs. 27,047 (Rs. 10,134).

The values of the Company's current assets and liabilities in Pakistan have been converted into Indian currency at the current rate of exchange, now recognised by the Government of India, and the resulting unrealised profit has been carried to an Exchange Suspense Account. Since the close of the year under review sanction to remit to this country the net trading profits earned in Pakistan during seasons 1948 and 1949 was obtained from the State Bank of Pakistan, and a total of Rs. (I) 3,62,892 was received and credited to the Company's account in India in May, 1953.

The crop harvested was 5,238 maunds as against 4,919 maunds in 1951. The average selling price in Pakistani Currency was Re. 1-3-9 per lb. as compared with Re. 1-1-0 per lb. in the previous year. Planted area—As the result of a recent survey the area under tea now measures 544.12 acres.

Estimates for 1953 provide for a crop of 5,200 maunds at an outlay of Rs. (P) 3,82,100, including inland freight and sale charges.

Clevedon Tea Company Limited

The directors of the above Company (Secretaries: Messrs. Duncan Brothers & Co., Ltd., Calcutta) submitted the audited accounts for the year ended 31st December, 1952.

The accounts showed a loss of Rs. 1,16,670 (loss of Rs. 1,56,218). On transfer of this sum to profit and loss account and after sundry adjustments, including transfers of Rs. 26,000 (Rs. 2,14000) from revenue reserve and Rs. 54,30 (*nil*) from buildings and machinery reserve, there was a balance at debit of profit and loss account of Rs. 34,635 (credit of Rs. 1,074) which the directors carried forward.

The values of the Company's current assets and liabilities in Pakistan have been converted into Indian currency at the current rate of exchange, now recognised by the Government of India, and the resulting unrealised profit has been carried to an Exchange Suspence Account.

The loss would have been much larger had not the greater portion of the crop, which was, some 740 maunds less than of the previous year, latterly sold at considerably enhanced prices. Unfortunately, this gain failed to offset the heavy loss sustained on earlier unremunerative sales concluded at a time when disastrously low market prices were ruling. Results were further aggravated by the continuance of the adverse exchange ratio.

The crop harvested was 5,659 maunds as against 6,400 maunds in 1951. The average selling price in Pakistani currency was Re. 1-0-7 per lb. as compared with As. 11-8 per lb. in the previous year. Planted area is now 551.42 acres.

Estimates for 1953 provide for a crop of 6,000 maunds at an outlay of Rs. (P) 4,38,480, including inland freight and sale charges.

TABLETS FOR URINARY TROUBLES

Cubeb powdered (No. 100)	1	lb.
Balsam copaiba solidifiable	1	„
Iron sulphate, dried	4	oz.
Venice turpentine	4	„
Sandalwood oil	4	„
Wintergreen oil	700	mins.
Calcined magnesia	8	oz.
Starch	1½	lbs.
Cane sugar 1 lb.	7	oz.
Acacia-starch paste	12	„

Reduce the copaiba and venice turpentine to about one pound, on a steam-bath or over a low heat. Remove the heat and stir in the calcined magnesia. Cool, triturate with the other powders and granulate. Mix the oils of sandal wood and wintergreen with sufficient bland oil, and put one drop on each tablet or spray.

Make 7 gr. tablet each by using die 13-32 inch.

VOICE & THROAT TABLETS

Citric Acid powder	2	oz.
Milk sugar, powder	2	lbs.
Sugar, powder	3	„
Gum acacia, powder	4	oz.
Carbolic Acid	½	„
Menthol	½	„
Tincture of iodine	4	fl. oz.
Solution of formaldehyde	3	„ „
Simple syrup		q.s.

Mix all the ingredients excepting carbolic acid, menthol and tincture of iodine, to a damp powder and pass through a 20 mesh sieve and dry. When ready for compressing, add the remaining three. Dry again in a warm place. Make 15 gr. tablets.

AGNIMUKHA CHURNA

Asafoetida	1	part.
Acorus calamus	2	parts.
Long-pepper	3	„
Ginger	4	„
Ajowan	5	„
Chebulic myrobalan	6	„
Plumbago root (chitramula)	7	„

Reduce the ingredients into powder form and pass through a cloth.

Dose : 20 to 40 grains with whey.

ASTHMA HERBAL DROPS

Tinct. of stramonium	1	part.
Laudanum	1	„
Anise ammonia	1	„

Mix.

Dose : 10 to 15 drops in hot sugar water, thrice daily.

CASTOR OIL EMULSION

Castor oil	2	oz.
Powdered acacia	6	dr.
Peppermint oil	3	mins.
Powdered tragacanth	16	gr.
Saccharin	4	„
Glycerin	3	dr.
Cacao	2	„
Water to make	4	oz.

Boil the cacao with glycerin and water for 5 minutes. Make a mucilage of acacia with 4 dr. of the cacao mixture and gradually add the castor oil and peppermint oil by shaking. Continue trituration until emulsified. Then add the remainder of the cacao mixture.

COUGH DROPS

Brown sugar	10	lbs.
Tartaric acid	2	oz.
Cream of tartar	½	„
Water	3	pints.
Aniseed flavouring		q.s.

Melt the sugar in the water, and when at a sharp boil add the cream of tartar. Cover the pan for 5 minutes. Remove the lid, and let the sugar boil up to crack degree i.e. if a quantity of syrup is allowed to drop on the cool floor it at once sets to a hard mass. At this stage turn out the batch on an oiled stone slab, and when cool enough to handle mould in the acid and flavouring. Pass it through the acid drop rollers, and when the drops are chipped up, and before sifting, rub some icing with them.

DYSPEPSIA POWDER

Ajowan Seeds, powdered	1	oz.
Rock Salt	1	„
Asafoetida (Hing)	1	„
Myrobalans	1	„

Mix.

Dose : 10 to 20 grains.

EASTON'S SYRUP

Iron, in form of wire	8.60	grams.
Phospheric acid, concentrated	62.50	millis.
Strychnine, in powder	0.57	grams.
Quinine sulphate	14.80	„
Simple syrup	700.00	millis.
Distilled water, sufficient to produce	1000.00	„

Dilute the concentrated phosphoric acid with an equal volume of distilled water in a small flask; add the iron and heat very gently until dissolved; add the solution to the strychnine and quinine sulphate previously triturated with 30 millilitres of the distilled water; when solution is complete filter the syrup, and pass sufficient distilled water through the filter to produce the required volume.

Dose : One to two fluid drachms.

FEVER MIXTURE

Quinine sulphate	½	dr.
Sulphuric acid (dill)	½	„
Syrup orange	1	oz.
Glycerin	4	dr.
Water to make	8	oz.

Dissolve the quinine in the acid and then add the other ingredients.

Adult dose : 1 ounce.

KIDNEY PILLS

These are diuretics and stimulants of the urinary tracts. A good recipe is as follows :—

Powdered squill	½	gr.
Powdered digitalis	½	„
Potassium nitrate	2	„
Extract of bucher	½	„
Oil of juniper	½	drop.

Make into a pill.

LIVER PILLS

Podophyllin	½	gr.
Rhubarb	2½	„
Extract of hyoscyami	2	„
Mucilage of tragacanth		q.s.

Triturate the ingredients in a mortar and make into a stiff dough. Then make into pills. The above composition is sufficient for one pill.

PILES OINTMENT

Tannic acid	40	gr.
Morphine	4	„
Oleic acid	30	„
Lanolin	120	„
Soft paraffin to make	1	oz.

Mix.

PTYCHO-SODA TABLET

Sodium bicarbonate	5	lbs.
Oil of Thymol	½	oz.

Thoroughly well granulate the soda and incorporate with thymol. The die for the tablet is 5/16th inch and each tablet weighs 5 grains.

LIVER OILS

In the extraction of oils from fish livers or other marine animal tissue by breaking down the tissue by dilute alkali, separating the scums containing the oil, and breaking this emulsion, there is used to break the emulsion a liquid—e.g., ethyl alcohol which is miscible with water but not with the oil. For example, 6 cwt. of halibut livers is pulped by live steam, the volume made up to 135 gal. with water, about 5 per cent. relative to livers of scale caustic potash added, and the mixture brought to boiling by steam and allowed to stand for 24 hours; the lower aqueous layer is run off, and the emulsion remaining is warmed by steam and broken by stirring in 5 gal. of industrial alcohol; 5 gal. of water is added to bring the oil to the surface, the aqueous layer run off, an equal volume of saturated brine added to the oil, and the whole boiled, settled, and passed through an oil separator.

RESIN PLASTER

To prepare resin plaster, first prepare litharge plaster according to the following formula :—

Litharge, in very fine powder	6	lbs.
Olive oil	1	gallon.
Water	1	quart.

Boil all the ingredients over a slow fire, constantly stirring to the consistence of a plaster, adding a little boiling water if nearly the whole of that used in the beginning has been consumed before the end of the process.

Now take this litharge plaster and proceed to make resin plaster in the following manner :—

Litharge plaster	7[illegible]	[illegible]
Olive oil		„
Pale yellow rosin	12	„

Melt the first two together in a bright and perfectly clean copper pan, and sift in the pale rosin,, stirring all the while. Then allow the mixture to cool. Lastly pull or work in the usual way.

Recipes for Small Manufacturers

ARTIFICIAL HONEY

Take sugar, 10 parts; rain water, 3 parts. Bring to a boil over a slow fire, and let boil gently for 15 minutes, skimming all the while. Let cool, and add 3 parts of good old strained honey and 5 drops of oil of peppermint for every gallon of produce. The best imitation is made with loaf sugar. If this be used, the article cannot, by the taste alone, be told from the genuine. If common brown sugar be used, it will be necessary to boil the syrup a little and to skim with care. The addition of 21 gr. of cream of tartar to the gallon is said to improve the article. It may be scented with a few drops of lemon to imitate orange honey.

MUKHBILAS

Coriander seed	1	tola.
Aniseed	1	,,
Parsley	1	,,
Nutmeg	1	,,
Ajawan	1	,,
Saffron	1	,,
Seeds of cardamom major	1	,,
Seeds of cardamom minor	1	,,
Cloves	1	,,
Dry rose petals	1	,,
Chua	1	,,
Camphor	1	,,

Take one tola each of the ingredients excepting the last two and soak them in good rose water for 12 hours. Then bray them together to a paste form and incorporate chua and camphor.

MAGIC WRITING PAD

Cardboard is coated with the following composition and covered with a sheet of waxed or oiled paper or cellophane. When the latter is written on with a stylus or pencil the writing appears. When this sheet is lifted away from the coated cardboard the writing disappears.

Beeswax	4	parts.
Venice turpentine	9	,,
Lard	4	,,
China clay	3½	,,
Carbon black	1	part.
Mineral oil	2	parts.

The consistency may be varied by varying the proportions of liquid in the formula.

GOLD COLOURING ON TIN

Shellac	5	oz.
Camboge	2	,,
Turmeric	2	,,
Dragon's blood	4	dr.
Methylated spirit	3	pints.

Dissolve the ingredients in methylated spirit and apply the lacquer on tin articles which should be thoroughly cleaned with soft soap and hot water and warmed.

PAINT & VARNISH REMOVER

Benzol	15	oz.
Toluol	15	,,
Alcohol	20	,,
Acetone	25	,,
Ethylene dichloride	20	,,
Ethyl acetate	5	,,

Mix. Then melt in 1 oz. paraffin wax.

Mop or brush on, and let stand for 10 to 15 minutes. Then rub off with a cloth, or scrape with a paint scraping tool.

DRAWING INK

(*a*)	Distilled water	50	parts.
	Borax	3	,,
(*b*)	Shellac, bleached	4	,,
(*c*)	Carbon black	2½	,,

Into the boiling (*a*) add (*b*) in small portion at a time till there is a clear solution. Strain.

Dispose (*c*) in a part of this shellac solution, and thin the smooth concentrate with the balance of it. Add salicylic acid 1/10 per cent. The dispersion of the carbon black is finest when using a colloid mill.

ARTIFICIAL LEMON SQUASH

Sugar	2	lbs.
Citric acid	1	oz.
Distilled water	28	,,

Dissolve and add the following, previously prepared :

Oil of lemon	½	dr.
Tinc. of lemon peel	1	oz.
Tinc. turmeric	½	dr.
Caramel	20	mins.

Shake up the tincture of lemon peel with the oil of lemon occasionally during 4 hours; allow the oil to separate, decant the tincture and mix the latter with the other ingredients and filter.

DENTAL IMPRESSION WAX

Among the preparations used by dentists for taking impressions are bees-wax, guttapercha, and plaster of paris. A reliable formula for such composition is as follows :—

Stearin	8	oz.
Dammar	12	„
French chalk	2	„
Carmine		to colour.

Melt the stearin, and shake into the dammer, previously powdered, then add the chalk and the carmine and geranium oil 30 drops.

PALM GUR MAKING

Palm gur is delicious, and it can be easily used as a sweetening agent in place of cane gur. Palm gur is prepared from sweet and fresh Neera and not from toddy.

There are four varieties of sugar yielding palms in India : Palmyra, date, coconut and sago palms.

The technique of tapping palms and making of gur is very easy; any person of ordinary intelligence can master this art within six months. The palmyra, coconut and sago palms throw out spathe when they are in florescence. These spathes are tapped, massaged and bound in order to accelerate the flow of juice. The upper most portion of the spathes is sliced off with a sharp knife and the exudation of the juice begins. This juice as called Neera is then collected into an earthen pot suspended to the spathe. In order that the juice may not get fermented, a small quantity of lime is deposited in the pot. The lime is taken out before Neera is converted into jaggery. Cleanliness of tools, pots and the tapped portion is an important factor in the process.

Neera is then collected and heated and superphosphate is added to it, after the lime is deposited at the bottom. Neera is decanted into the pan for evaporation.

It is necessary to remove the scum during the process of boiling. So also the walls of the pan have to be cleared of scum, so that the resultant product may not be charred or turned bitter.

When heated to 116°C. to 118°C. Neera is converted into jaggery. Striking the pan is done at this juncture and the pan is removed from the furnace. The viscous mass is slowly stirred so that the hot pan may not cause the product to be charred at the bottom. The jaggery is then poured into suitable moulds and hard blocks of gur are ready for use after some time.

BRAHMI OIL

In preparing this medicated oil, sesame oil is generally used. This oil, before being boiled with medicinal substances is first of all heated to deprive it of any water by evaporating. It is then purified by steeping in it the following substances for 24 hours viz., Maddar 1/16 part in weight of oil, turmeric, wood of symplocos racemosa, tubers of cyperus rotundus, a bark called nilaka, the three myrobalans, roots of danus odoratissium, each one sixty-fourth part pavonia odorator and the tender shoots of Pandanus odoratissium, each one sixty-fourth part in weight of the oil. These ingredients in fine powder should be soaked in the oil, with the addition of an equal quantity of water for a day. The mixture should then be boiled till the water is evaporated, and finally strained through clean cloth. To the oil thus prepared dried brahmi herb, is added in the proportion of 4 parts of the herb to 16 parts of oil. The mixture is then boiled till the watery parts are all evaporated. This is then allowed to cool and strained.

CELLULOID TOYS FROM WASTE FILMS

Celluloyd	100	parts.
Acetone	100	„
Magnesia	25	„
Levigated chalk	5	„
Glycerine	22	„
Ether	10	„
Methylated spirit	15	„

The mass runs easily into the moulds and sets rapidly, so that, by drying at 20°C. the article may be turned out completely in 3 hours.

CHUTNEY

Gur	1	seer.
Green ginger	1	„
Garlic	1	„
Raisins stoned	¾	„
Chillies	4	chs.
Mustard seed	½	seer.
Vinegar		q.s.

Boil the gur to a syrup in one seer of vinegar. Put it into a large jar and keep it out in the sun for a fortnight.

POLISHING CLOTH

Oleic acid	1	lb.
Stearic acid	½	oz.
Vascline	1	„

Melt together, remove from fire and add cassia oil or methyl salicylate or terpineol, ½ oz. Cut good cotton flannel into desired size, dip in the mixture till thoroughly saturated, then run through a tight wringer. Fold and wrap in oiled paper.

WHITE ZINC PAINT

974 H. L. T., Karachi—Wants a recipe of white zinc paint.

Zinc white	4-½	cwt.
White barytes	1-½	„
Boiled linseed oil	9-½	gallons.

Mix the ingredients together in a roller mill. This forms a stiff mass known as ready mixed paint.

When using this paint it should be diluted with more linseed oil and driers. A typical formula is as follows :—

Zinc white paint	1	cwt.
Patent driers	7	lbs.
Boiled linseed oil	1½	gallon.
Turpentine oil	½	„

TOFFEE

978 C. J. D., Bandra—Desires to have a good formula of toffee.

Sweetened condensed milk	3	lbs.
Full cream milk	1	quart.
Sugar	3½	lbs.
Glucose	4	„
Butter	¾	lb.

Vanilla and Salt to flavour.

Cook to crack all the ingredients together in an earthenware vessel or enamel except the last two. Then add the butter and vanilla essence. Finally cut in cubes of required size and wrap in paper.

VASELINE POMADE

846 S. C. M., Rajkot—Desires to know recipes of vaseline pomade.

The basis consists of 6 to 8 parts of white vaseline and 1 part of ceresin melted together, and while melting coloured with the substances undernoted according to the floral odour desired. The quantities of perfumes here given are for not less than 2 lbs. of the basis: —

HELIOTROPE

Oil of lemon	2½	dr.
Oil of bergamot	½	„
Oil of lemon grass	½	„

Colour—Tincture of gamboge.

CITRON

Oil of cassie	2	dr.
Oil of bitter almond	40	mins.
Oil of cinnamon	½	dr.
Balsam of Peru	2	„

ORANGE

Oil of orange peel	2½	dr.
Oil of bergamot	½	„
Oil of rose geranium	½	„

Colour—Oil soluble orange aniline.

RENDA

Oil of bergamot	2	dr.
Oil of bitter almond	1½	„
Oil of neroli	1	„
Oil of Ylang-ylang	15	mins.

ROSE

Oil of rose geranium	½	oz.
Oil of bergamot	1½	dr.
Oil of neroli	½	„
Colour—Alkanet	2	„

RED NAIL POLISH

Celluloid film, cut small	200	gr.
Amyl acetate	2	oz.
Acetone	5	„
Spirit red	80	gr.

Clean the celluloid film by soaking it in soda solution for 2 or 3 hours, then scrape with a blunt knife. Dry in the sun. Then cut it into small pieces and weigh out and put in the mixture of acetone and amyl acetate in a wellstoppered bottle. Then add the colour. Keep aside for a day or two; then strain and bottle.

BROWN COLOUR ON TIN

4092 S. G. M. E., Madras—Wishes to have a process of making brown colour on tin etc.

Copper sulphate	10 ozs.	62.5	grms.
Ferrous sulphate	10 „	62.5	„
Water	1 gal.	1	litre.

The suitably cleaned tin article is treated in this solution at a temperature of 160°F. and acquires a brown shade. After rinsing and drying it is polished with a waxed brush and thus assumes a fairly good bronze colour.

TINCTURE IODINE

Iodine	100	grams.
Potassium iodide	60	„
Distilled water	100	c.c.
Alcohol (90%) sufficient to produce	1000	„

Dissolve the potassium iodide and iodine in the distilled water; finally, add sufficient quantity of alcohol to produce the required volume.

PURIFYING SUGAR

866 K. B. F., Madura—Wants to know a process of purifying sugar.

To convert inferior sugar including the second sugar into refined crystalline white sugar, it is boiled with water and the syrup is clarified with milk till a perfectly clear syrup is obtained which is then concentrated by continued boiling till the right consistency is attained. When ready to crystallise, the syrup is thinner than that of the cane-juice rab and that state is easily determined by the experienced eye of the boiler. The hot liquid is transferred into a round iron pan in which it is "aired" in order to favour crystallisation ; as soon as the fine crystals become visible the mass is transferred to suitable vessels to cool and crystallise further. After two or three days to crystallise the material is ready to be treated in the centrifugal. The sugar mass is tipped into an enamelled basin or brass or copper vessel, the hard lumps are broken with a wooden peg unless there is a pug mill for that operation, and put into the basket of the centrifugal, mixed, if necessary, with syrup eliminated from a previous charge to facilitate the machinery.

It is only necessary to wash this sugar very sparingly with water injected by the syringe into the basket of the centrifugal machine.

EAU-DE-COLOGNE

882 N. G. H., Bombay—Wants to know good formulas of eau-de-cologne and tincture iodine.

Bergamot oil	1	oz.
Lemon oil	½	„
Rosemary oil	2	dr.
Neroli oil	30	mins.
Lavender oil	4	dr.
Orange oil	2	„
Rectified spirit	2	lbs.

Mix the ingredients one by one with brisk shaking. Set the whole aside in a stoppered vessel for a fortnight. During this period shake the vessel thrice daily. Finally filter and pack.

MIRROR METALLIQUE

This term is applied to a beautiful crystalline surface which may be induced on tin plate—by which is meant iron or steel coated with tin. The tin plate is first heated until the tin shows signs of melting at the edges and then, while hot is plunged into the following acid solution :—

Nitric acid	1½ fl. ozs.	9 c.c.
Sulphuric acid	16 „ „	100 „
Water	1 gal.	1 litre.

A somewhat coarser structure is obtained if the acid solution is used at a temperature of about 100°F. After rinsing and drying out in sawdust the sawdust is completely removed by brushing and the work lacquered, using colourless, lacquer. Colour effects can be obtained by the use of tinted lacquers. Such tinted lacquers are prepared by dissolving aniline dyes in the thinner, which is then added in the required amount to give the necessary colour. An excess of thinner will, however, make the lacquer flow too readily. There is thus some scope for coloured effects by this process.

CLEANING PEARLS

831 M. C. J., Banaras—Wants to know processes of cleaning pearls.

Pearls turn yellow in the course of time by absorbing perspiration on account of being worn in the hair, at the throat. and on the arms. There are several ways of rendering them white again.

1. The best process is said to be to put the pearls into a bag with wheat bran and to heat the bag over a coal fire, with constant motion.
2. Another method is to bring 8 parts each of well-calcined, finely powdered lime and wood charcoal, which has been strained through a gauze sieve, to a boil with 500 parts of pure rain water, suspend the pearls over the steam of the boiling water until they are warmed through, and then boil them in the liquid for 5 minutes turning frequently. Let them cool in the liquid, take them out, and wash off well with clean water.

BLACK MARKING INK

Nitrate of Silver	2	oz.
Soda carbonate	3	„
Water	10	„
Tartaric acid	¾	„
Litmus	½	„
Gum	4	„

The nitrate of silver is first dissolved in 4 oz. of water and the carbonate of soda is dissolved in another lot of 6 oz. of water. Add the soda solution to the silver solution so long as a white precipitate is formed. Filter and wash the precipitate with distilled water and rub it in a mortar with some water and tartaric acid. Now add ammonia cautiously until the precipitate is redissolved. Finally add litmus or water soluble blue and the gum in solution. Dilute, if necessary.

SCENTED HAIR OIL

971 M. R., Veguppatti—Wishes to have a good formula of preparing scented hair oil.

Refined Sesame oil	10	lbs.
Red dye (Oil soluble)	50	grains.
Bergamot oil	3	dr.
Rosemary	1	,,
Cinnamon oil	1	,,
Sandal oil	2	,,
Benzyl acetate	2	,,
Coumarin	20	grains.
Musk otto	2	dr.
Geranium oil	1	,,
Lavender	2	,,
Benzyl benzoate	1	,,
Lemon oil	1	,,

Mix with stirring. Keep aside for a couple of days in a closed pot and then bottle.

LIVER EXTRACT

963 C. J. R., Vaijapur—Desires to know a process of preparing liver extract.

Liquid extract of liver is prepared by extracting trimmed ox or sheep liver by the process described for dry eftract of liver (given later). The extract, obtained by precipitation and granulation with dehydrated alcohol, is collected on a filter and dissolved in distilled water.

Glycerine, alcohol (95 per cent.), and distilled water are added in such proportions that 1,000 millilitres of the resulting liquid contain a quantity of the extract-equivalent to 8,000 grm. of the original liver, not less than the equivalent of 10 per cent. v/v of alcohol (95 per cent.) and not less than 20 per cent. v/v of glycerin.e

DRY EXTRACT OF LIVER

This is a selected fraction of an alcoholic extract of ox or sheep liver and contains the specific principles which increase the number of red corpuscles in the blood of persons suffering from pernicious anemia.

Mince 5,000 g. of trimmed ox or sheep liver; add 5,600 mililitres of alcohol (80 per cent.) and 5.5 mililitres of a mixture of equal volumes of sulphuric acid and distilled water; set aside for twelve to eighteen hours, stirring frequently; filter and reserve the filtrate.

Collect the residual liver tissue and add to it 12,500 millilitres of alcohol (50 per cent.); set aside for a further twelve to eighteen hours, stirring frequently; filter. Mix the two filtrates and evaporate the mixture under reduced pressure to 500 millilitres; and 500 mililitres of dehydrated alcohol; allow the resulting precipitate to settle; decant the clear solution and filter the remainder, or separate the liquid from the solid matter by means of a centrifuge, washing the filter or the centrifuge vessel and contents with alcohol (50 per cent). By evaporation under reduced pressure remove the alcohol from the mixed liquids, and reduce the residue to a syrupy consistency, then pour the product with constant stirring into its volume of dehydrated alcohol. Manipulate below the surface of the liquid the extract which is precipitated, so as to expose as great a surface as possible to the dehydrating action of the alcohol; then pour off the alcohol and relace it with a further sufficient quantity of dehydrated alcohol; let the extract remain exposed to the dehydrating action of the alcohol until it becomes brittle. Remove the alcohol by filtration; dry the extract in vaccuo; reduce it to a powder as rapidly as possible, then dry again in vaccuo. Weigh the dry powder, mix with it not less than one-tenth of its weight of finely powdered dry sodium chloride, transfer the product as quickly as possible to tubes, placing in each the amount equivalent to 225 g. of the original liver. Close the tubes hermetically.

METAL PRINTING ON CLOTH

920 T. S. R., Madura—Wants to know a process of metallic printing on cloth.

Metal printing is a problem which has occupied the attention of many printers. Metals such as aluminium leaves, silver leaves and gold leaves are printed on cloths used for decorative purposes.

There are two methods of printing, one of which is described below. This method is commonly known as the varnish method. Here copal varnish is generally used. Ordinary white lead is added to a sufficient quantity of varnish to get a pastelike thing.

Wooden blocks are of no use. The designs are cut in thin sheets of tin or copper. Place the tin sheet on the cloth and with a knife spread the paste on the sheet and then scrape it. The paste enters through the designs cut in the sheet and sticks to the cloth. Small leaves of the metal are spread over. When the paste is hardened brush lightly. Only the leaves sticking to the paste will remain.

Another paste is made as follows: Use rosin and linseed oil. Heat the two till the rosin completely dissolves and forms a uniform viscous liquid. Add white lead or chalk to make it a paste.

MALTED MILK FOOD

862 G. P. S., Gursahaigunj—Wishes to have a process of making malted milk food and also a formula of nicotine.

Malt extract, powder	5	oz.
Skimmed milk powder	2	„
Sugar powdered	3	„

Mix thoroughly by shaking and rolling in a dry can. Pack in an air-tight container.

NICOTINE

Infuse tobacco leaves 4 hours with warm water slightly acidified with hydrochloric acid, strain, and evaporate to a syrupy fluid. To the fluid add carbonate of soda in excess, and shake out the akaloid with ether. Separate the ether and shake it with a dilute solution of tartaric acid; remove the acid soiution and evaporate to a small to the solution and distil in a current of hydrogen. On cooling the distillate the nicotine separates in oily drops.

BISCUITS

1231 A. M., Panchgoni—Wishes to have a few recipes of biscuits.

The following three recipes of biscuits would be found useful :—

I

Flour	16	lbs.
Butter	6	„
Cream of tartar	8	oz.
Sodi bicarb	4	„
Milk	1	gal.

Add a little sugar. Make a stiff dough. Then cut out with 3 in. plain round cutter, dock and bake on flat tins in a hot oven.

II

Fine wheatmeal	49	lbs.
Flour	21	„
Butter	12½	„
Sugar	10	„
Corn flour	8	„
Sodi bicarb	12	oz.
Cream of tartar	6	„
Sodi bicarb	4	„
Ammon carbonate	4	„
Salt	4	„
Milk	35	lbs.

Make a dough and then cut out with 3 in. cutter and bake on flat tins as usual.

III

Fine white flour	1	lb.
Best arrowroot	1	„
Butter	8	oz.
Fresh egg	8	only.
Baking powder	½	oz.
Salt	½	„

Shift together flour and arrowroot and add the baking powder and salt. Cream the butter and sugar. Mix the former in the latter and stir the yolk of egg. Knead into a dough, roll out and cut into form and bake on a greased tin for 5 or 10 minutes.

SOFT SOLDER

1014 R. G. M., Tura—Wishes to know a formula of soft solder.

Bismuth	50	parts.
Tin	25	„
Lead	25	„

Fuse in a crucible and then pour over oil. The alloy thus obtained will melt at 392°F and serves as a solder for brass, copper, etc.

Rosin	4	parts.
Raw linseed oil	1	part.
Honey	1	„

Melt the resin and oil together, and incorporate the honey. Then spread upon writing paper with a brush. This will not dry up in a long time and is so sticky that it holds fast the legs of an insect, attracted to it or accidently coming in the contact.

COLOURING IVORY

1079 M. R. T., Bhavnagar—Wishes to have formulas of colouring ivory.

BLACK

Immerse the ivory in a boiling solution of logwood, take it out and wash it in a solution of copperas.

BLUE

Immerse the ivory in a mixture of sulphate of indigo and water, partly neutralized with potash.

GREEN

Steep blued ivory in a solution of nitro muriate of tin, and then in a decoction of fustic; or it may be at once dyed green by steeping it in a solution of acetate of copper.

YELLOW

Steep the ivory in a bath of neutral chromate of potash, and afterwards in a boiling solution of acetate of lead.

RED

Steep the ivory for a short time in a solution of tin, then in a decoction of Brazil or cochineal.

VIOLET

Moisten the ivory with a solution of tin, as before then immerse it in a decoction of logwood.

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

CREATING CUSTOMERS BY ADVERTISEMENT

942 R. L. G., Jubbulpore—Will you please explain the efficacy of good advertisement in creating new customers ?

In consequence of the complexity of the industrial situation brought in by the development of civilised and economic surroundings in which we are living and moving there has grown up a feeling of competition which has evolved the modern art of advertising. Advertising is gradually, and withal specially growing into a professional art ; when well done it is indeed the quickest and cheapest means to attract new customers. Every one in business is now feeling the value and necessity of advertising—the manufacturer creates a demand for his products through advertising, the agent persuades the dealer to carry a good stock, the dealer educates the people into new needs, all through diverse methods of advertisement. Every manufacturer, every trader, every dealer avails himself of every opportunity by advertising propaganda of varying methods to place the public mind in a receptive condition regarding his commodities. It is indeed experience of many that nothing pays better than right advertising at the right time in the right medium. No firm whether manufacturer or seller can now-a-days ignore the power of advertising even if it is merely for dissemination of information of his goods. Public must be taught the good points even of good articles, otherwise it is slow to appreciate.

STARTING A STATIONERY SHOP

761 K. C., Kanpur—Writes I have a mind to start a stationery shop here. Will you therefore, kindly enlighten me on this business ?

There should be a good and pleasant locality for a stationery shop. A railway station may be necessary near the place, but the place should be densely populated. The site should be selected near the bazar or chowk.

In the shop there should be many good almirahs and all of equal size. These almirahs should be arranged in such a way that customers may see the articles very easily. All of them should be nicely varnished and the windows made of glasses. All the almirahs should be arranged in rows on the floor of the ground. There must be some stools so that the assistants can pick up the articles from the upper shelf of the almirahs. Some strong chair should be provided for the customers so that they may purchase articles by sitting on.

Much stocks may be kept, but it is necessary to keep the stock in proportion to the customer's demand. The overstock is sometimes harmful because the articles become bad and rotten. Besides office stationeries and toilet goods you may also stock the following : Biscuits of various kinds; butter of different varieties; fruits in tins; jams and jellies ; Liptons and Brookebond tea of every size and quality; vinegar; lozenges; Horlicks; Milk food; Toffee and chocolates, etc., etc. From your letters it appears that you are interested in books also. You may stock books prescribed by local schools and colleges. Besides text books you may stock general books such as novels, fictions and publications on general knowledge. Two or three almirahs should be kept separated for stocking books on various subjects. Don't stock books just because you think they ought to be sold or because you admire the author yourself. Your customer may not be upto your level and in any way your business is to sell them books but not to educate them. Gauge the taste of your public but don't let them see you doing it. Be topical and notice the signs of times and be in advance of the season. Watch the books and book novelties of the season and take full advantage of the time; and put them in a prominent place where enthusiasts may see and possibly buy.

501 C. M. Y., Bellary—Reply to your previous letter has already been sent by post.

502 H. A. B. B., Kirkee—Following is a recipe of lice killer: Sulphur 1 oz.; carbolic acid 4 oz.; crude napthol 1 oz.; chalk powder 1 lb. Mix and pack in bottles. All the chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane and Calcutta Mineral Supply Co. Ltd., 31. Jackson Lane; both of Calcutta.

503 M. A. S., Lahore—For belting enquire of the following firms: Bengal Belting Works Ltd., 2, Dalhousie Square East; Birkmyre Bros. Ltd., 7, Stephen House, 4, Dalhousie Square and Choudhury Belting Works, 2, College Square; all of Cacutta. Wants to be put in touch with cast iron pulley shaft manufacturers of Batala.

504 L. C. B., Golaghat—For machineries required for cottage industries write to Oriental Machineries Supplying Agency Ltd., P12, Mission Row Extension; Small Machineries Mnfg. Co., 22, R. G. Kar Road and R. J. Alcock & Co., P. O. Box No. 231, all of Calcutta.

505 P. K. B., Calcutta—Following is a formula of spirit gum for theatrical use: White rosin ½ oz.; tolu balsam ½ oz.; gum benzoin ½ oz.; gum sandarac ½ oz.; rectified spirit 4 oz. Dissolve the resins in the spirit, strain and allow to settle until clear. All the ingredients may be had of Banshidhar Dutt, 126, Khengrapatty Street; Calcutta.

506 R. S. M., Jharia—Following is a list of lungee merchants: A. H. Rahaman, 37, Lower Chitpur Road; Abdur Rahaman Sowdagar, 58-2, Lower Chitpur Road; Calcutta Palavakat Lungi Co., 22, Zakaria Street: Chamber of Handloom, 48, Lower Chitpur Road; G. Gankala Lungi Co., 165-6, Harrison Road; K. A. S. Zainul Abdin & Co., 53, Lower Chitpur Road; N. D. Bose & Co., 146, Lower Chitpur Road; and S. Abdul Jabbar, 45-9, Lower Chitpur Road; all of Calcutta.

507 D. C. P., Silchar—Address of National Moulding Co. Ltd., is 26, Upper Chitpore Road, Calcutta-7. For Elephant brand knitting and crochet thread write to Royal Elephant Twine Ball Manufacturing Co., 12. Tamer Lane. Cacutta.

508 R.. B. N., Rewa—We do not deal in any article we only furnish information. As far as we know face powder, snow cream etc., are not available in bulk. You may however communicate with the following firms: Anoompa Chemical Works, 4-2, Chanditala Lane, Tollygunge, Calcutta and Cacutta Miscellany, 12, Ghose Lane, Calcutta.

509 C. I. C., Villupuram—You may start arrowroot business on small scale. Procure tapioca flour from the market and put in tin cans with your own label and sell in the market. You may start the business with Rs. 5,000 in the beginning.

510 K. D. S., Mathura—Homeopathic books and medicines may be had of Hahnemann Publishing Co., 165, Bowbazar Street; Economic Homeo Pharmacy, 61, Netaji Subhas Road; Indian Homeopathic Stores, 129-1, Bowbazar Street; King & Co., 90-7A, Harrison Road and M. Bhattacharyya & Co., 84, Netaji Subhas Road; all of Calcutta.

511 J. R. B., Bombay—Following is a formula of laundry marking ink: Aniline oil 85 parts; potassium chlorate 5 parts; distilled water 44 parts; hydrochloric acid, pure (sp gr. 1.124) 68 parts; copper chloride pure 6 parts. Mix the aniline oil, potassium chlorate and 26 parts of water and heat in a capacious vessel, on the water bath, at a temperature of from 175°F to 195°F until the chlorate is entirely dissolved then add one-half of the hydrochloric and continue the heat until the mixture begins to take on a darker colour. Dissolve the copper chloride in the residue of the water, add the remaining hydrochloric acid to the solution and add the whole to the liquid on the water bath, and heat the mixture until it acquires a fine red violet colour. Pour into a flask with a well fitting ground glass stopper, close tightly and set aside for several days, or until ceases to throw down a precipitate. When this is the case, pour off the clear liquid into smaller (one drachm or a drachm and a half) containers. Chemicals may be had of B. C. Patel & Co., 143, Princess Street; Rasiklal & Co. Ltd., Varjivan Mansion, Princess Street and Tribhovandas Khimji & Bros., 13, Princess Street; All of Bombay.

512 B. C. R., Calcutta—For rubber baloons enquire of the following firms: Aero Rubber Works, Kottayam, Travancore; Baichu Rubber Industry, Itwari Station, Nagpur; Bombay Rubber Co., 428, Kalbadevi Road, Bombay; Empire Rubber Works, Surjulag Mill Compound, Tardeo, Bombay 7; Gandhi Industries, 272, Musjid Bunder Road, Bombay-3; Hari Sons, Ayalpur, Cochin; Kundanmal Mamlal, Souri Bldg., 78/80, New Hanuman Lane, Bombay-2; Oriental Rubber Industries, Dhurampet, Nagpur; Swastik Rubber Industries, Wardha; M. P. and United Rubber Works Ltd., 51, Tangra Road, Calcutta-15.

513 L. R. P., Madras—A remarkable oily liquid having a brown colour and smelling so like musk that every few noses are able to detect the difference between the natural product and the artificial body is obtained by a new process. 2 parts of isobutyl alcohol; 3 parts metaxylol and 9 parts of chlorate of zinc are heated together for 8 or 9 days at a temperature of about 440° or 450°F in a strong vessel, the pressure inside which speedily rises to nearly 30 atmospheres but gradually declines to about a whole is allowed to cool gradually. The crude product so obtained is purified by distillation once or twice repeated oily fluid comes over between 220° and 260°F, this when rendered slightly alkaline is the "musk" in question and it may be diluted with alcohol for the use of the perfumer, to any desired degree of odoriferous strength.

514 A. G., Calcutta—For cotton waste enquire of Textile Waste Co., 113C, Netaji Subhas Road, Calcutta; Bharat Hardware & Textile Syndicate, 138, Canning Street, Calcutta; East India Trading Co., 2, Church Lane, Calcutta-1; Rajasthan Syndicate, Room 27, 67B, Netaji Subhas Road, Calcutta and Hemraj Cotton Waste Factory, Anwargunge, Kanpur.

515 R. J. B., Kanpur—Drakshasava is prepared from the fermented juice of grapes. For this purpose take 50 parts of fermented juice of grapes, 10 parts flowers of woodfordia floribunda and 10 parts sugar and mix. Keep in a closed earthen vessel in a cool place for a month. Then strain and bottle.

516 S. N. C., Jamshedpur—Indigenous raw materials may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta. Chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane and Allied Agency, 16, Bonfield Lane; both of Calcutta.

517 C. B. R., Asansol—Hosiery goods may be had of the following firms: A. Ebrahim Bros., 15, Zakaria Street; A. K. Sinha, 15, Chandney Chowk; B. V. Reddy & Sons, 171A, Harrison Road; Bengal Hosiery, 31-32-33, Chandney Chowk; Burdhan & Co., 36, Chandney Chowk and Durga Stores, 94, Chandney Chowk; all of Calcutta.

518 M. A. M. K., Porbandar—For soda fountain write to The Essence & Bottle Supply Agency, 14, Radha Bazar Street, Calcutta; Orient Traders, 5, Ezra Street, Calcutta and Andrew Yule & Co. Ltd., 8, Clive Row, Calcutta.

519 M. C. P. N., Virudhunagar—Following is a process of manufacturing camphor tablets: Moisten camphor powder or crystals with a smallest quantity of absolute alcohol and then compress into sheets in a suitable mould. Then allow the alcohol to evaporate by keeping the sheets in a tray for a few minutes. Lastly cut the sheets into tablet forms by means of punching machine.

520 I. O. C., Karachi—You may consult Safety Matches and Their Manufacture by K. C. Das Gupta published from this office, price Rs. 5/12/- including postage. Process of manufacturing hydrogenated oil will be found in Vegetable Oil Industry published from this office, price Rs. 3/12/- incuding postage. We have no book on porcelain ware manufacture, jute carpet and tar or rubber carpet manufacture.

521 C. I. C., Villupuram—Reply to your previous letter has already been published.

524 T. S., Madras—Following is a formula of soluble Chinese blue: To make soluble chinese blue, take 2 parts of the blue best quality and rub with 1 part of potassium ferrocyanide to a very fine powder and add 100 to 200 parts of distilled water according to strength of colour required. Shake occasionally for an hour and filter.

526 K. G. R., Lahore—To prepare malt steep barley in water for two or three days when it will swell and become somewhat tender and the water is coloured reddish brown. Now drain off the water and spread the barley upon a stone floor about two feet deep. Heat develops into it and the barley begins to germinate the radicle making its appearance first. At this stage stop the growth of the grain by spreading it more thinly, and turning it over for two days. Now make up into heaps and allow it to stand for a day when it becomes hot. Dry the grain thoroughly in kiln by a slow regulated heat when the material will be converted into malt.

527 M. L., Madhubani—Glass bottles may be had of Bharat Glass Works Ltd., 60-3, Barrackpore Trunk Road, Belgharia; Sodepur Glass Works, Sodepur; Sree Gobindo Glass Works, Ramrajatola, Howrah; Krishna Silicate & Glass Works Ltd., 17, Radhabazar Street, Calcutta; Victoria Glass Works, 130, Mechuabazar Street, Calcutta and Calcutta Glass & Silicate Works Ltd., 9, Kundu Lane, Calcutta.

529 D. S. J. R. C., Bangalore—We have no book dealing with the manufacture of magnesia 85 p.c.

530 J. M. P. S., Parlakimedi—Fancy cartoons may be had of S. Antool & Co. Ltd., 91, Upper Circular Road, Calcutta-9 and Bengal Cardboard Industries & Printers Ltd., 26, Gorachand Road, Calcutta. Blocks may be had of N. Dey & Co., 1, Bhim Ghose Bye Lane and Dass Brothers, 11, Garanhata Street; both of Calcutta. Slides may be had of Asoke Bagchi's Art Studio, 109, Cornwallis Street, Calcutta and U. A. Studio, 49, Karbala Tank Lane, Calcutta-6. Eucalyptus oil may be had of Ananda Chemical Works, Bombay-4; Coonoor Eucalyptus Oil Distillery, Coonoor and Crescent Eucalyptus Oil Refinery, Mettupalaiyam, Trichinopoly.

531 S. M. S. B., New Delhi—We are not aware of any such association and also any journal published.

533 O. K. S. M. H. P. P., Myanaung—Pharmaceutical chemicals may be had of M. Bhattacharyya & Co., 85, Netaji Subhas Road and Butto Kristo Paul & Co. Ltd., 1 & 3, Bonfield Lane; both of Calcutta.

534 A. E. W., Pathankot—The liquid compression in the hydraulic brakes of the modern auto consists of equal parts of denatured alcohol and castor oil. The alcohol thins the oil and acts as an anti-freeze. The castor oil lubricates the piston and is the fluid through which the pressure is transmitted.

536 V. P. B. A., Madras—Reply to your previous letter has been sent by post.

539 I. F. T. C., Bareilly—We have not got such a book. American addresses of asphalt is not known. You better enquire of the following firms: Bitumen Emulsion (India) Ltd., 7-1, Hide Road, Kidderpore, Calcutta; Universal Asphalt Products & Construction Co., La Citadelle, Queen's Road, Bombay and Chandulal Jethalal & Co., Mirchi Gali, Katha Bazar, Bombay. Process of refining spindle oil will appear in due course.

540 A. R., Raipur—Plastic goods may be had of Abdul Kayam Esufally & Bros., 193, Abdul Rehman Street, Bombay-3; Cawnpore Industries Ltd., 11-173, Civil Lines, Kanpur and Hindusthan Plastics Co., 8, Royal Exchange Place, Calcutta. For plastic signboards enquire of Gem & Co., 325, 326, China Bazar, Madras.

541 V. V. R. N., Pundi—Process of manufacturing carbon paper will be found in Prospective Industries published from this office, price Rs. 3/12/- including postage.

542 P. P. H., Calcutta—For sheet metal working machine enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta and Volkart Bros., 8, Netaji Subhas Road, Calcutta.

543 G. M., Malighati—We do not deal in any machine. For weaving machine you may enquire of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta.

545 P. P. F., Mansa—Pill making machines may be had of Small Machinery Manufacturing Co., 22, R. G. Kar Road, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

546 R. W. B., Sagar—For fencing wire and barbed wire enquire of Indian Steel and Wire Products Ltd., Indranagar, Singhbhum; International Wirenetting Stores, 62, Netaji Subhas Road, Calcutta; Zenith Wire Netting Works, 113, Netaji Subhas Road, Calcutta and National Wirenetting Stores, 113-G, Netaji Subhas Road, Calcutta.

547 K. D., Perala—Pearl and coral may be had of Jein & Co., 10, Old Court House Street; Benode Behari Dutt, 7, 7-1, 7-2, Old Court House Corner; N. Lilaram, No. 63, College Street and L. H. Lilaram & Co. Ltd., 10, Park Street; all of Calcutta.

548 S. N. C., Dharmapuram—For red capsule enquire of Essence & Bottle Supplying Agency, 14, Radha Bazar Street, Calcutta.

550 N. S. G. N. S., Jaipur—Waxes may be had of Banshidhar Dutt, 126, Khengrapatty Street and Calcutta Chemical Co. Ltd., 10, Bonfield Lane; both of Calcutta.

551 S. N. L., Fatehgarh—Acid blue is known as ink blue. Both acid blue and phenol black may be had of Fuzlehussein & Bros., 44, Armenian Street and Champalal Agarwala, 45, Armenian Street; both of Calcutta.

552 R. S., Farrukhabad—For glass wool enquire of General Electric Co. (India) Ltd., Magnet House, Chittaranjan Avenue, Calcutta and Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta.

553 M. L. M., Panchala—We have no arrangement for giving practical training in incence sticks and tobacco preparations. You may however consult Indian Tobacco and its Preparations published from this office, price Rs. 3/12/- including postage. Following is a formula of incence sticks: Benzoin 100 parts; Tolu balsam 50 parts; Charcoal 700 parts; Saltpetre 50 parts; Sandal wood oil 50 parts; Patchouli oil 15 parts; Cascarilla oil 30 parts; Grain musk 5 parts. Mucilage of acacia, a sufficient quantity to make thick syrupy consistency. To make sticks dip into this dry splinters of bamboo and expose them vertically in the sun to dry.

554 D. M. J. S., Bikaner—Following is a formula of ultramarine blue: China clay 100 parts by weight; sulphate of soda 41 parts by weight; Carbon 17 parts by weight; Sulphur 13 parts by weight; Sulphite of soda 26 parts by weight. Take the ingredients free from iron and grind fine. Next heat in a muffle furnace in closed pots. This produces white ultramarine and turns green on exposure to air for some time. The latter is mixed with 4 per cent sulphur and roasted in shallow pans, must be well stirred.

555 R. M. R., Hazaribagh—Following is the process of curing rabbit skin: Stretch the skin and tack it tightly on a board; scratch off all the fat with a blunt knife, and also remove as much of the congealed blood as possible. Now soak a rag with strong acetic acid (33 per cent, but no stronger) and rub it well into the skin going into every nook and corner. Set aside to dry for one or two days, then repeat the acid dressing, when this second dressing is thoroughly dry, apply a 10 per cent solution of ammonium sulphate with a good sized paint brush, and apply similarly a 10 per cent solution of washing soda. The ammonia then liberated slowly neutralises the acetic acid in the skin. This process is repeated the next day, then after two days the skin is raised under the tap, while still tacked on the board, using the hand to cause the water to penetrate. Set aside to drain and then dry slowly in a warm room but not against the fire. Finally when dry rub well with either benzoated lard or linseed oil.

557 C. V. R. R., Chilakalapudi—A good recipe of incence stick will be found under No. 553.

557 M. R. B., Burdwan—Marbles and marblites may be had of A. B. C. Floors, 13, Dalhousie Square; Crown Italian Marble Works, 9, Mission Row; International Marble Co. Ltd., 132, Canning Street; P. N. Mehta & Co., 156, Radha Bazar Street and Powell & Co., 81, Bentinck Street; all of Calcutta. Following is a list of leather dealers: Anwar Leather Stores, P-15, Bentinck Street, Calcutta; Bengal Tannery

Co., 31/14, Lower Chitpore Road, Calcutta; Dost Mohamed & Sons, 7, Bentinck Street, Calcutta; Mazhar Salim Leather Co., G. P. O. Box 2485, Calcutta; S. Lal Hussain, 75, Bentinck Street, Calcutta; A. V. Mohamed & Co., 247, Angappa Naick Street, Madras and M. M. Mohiadeen Thumby & Co., 228, Angappa Naick Street, Madras.

558 R. K. D., Calcutta—Slate pencils may be had of Leela Slate Works, Markapur, Kurnool; Sree Narmada Slate Works, Markapur, Kurnool and Sri Vivekananda Swadeshi Slate Works, Markapur, Kurnool. Printing ink may be had of Coates of India Ltd., 3/1, Canal East Road, Calcutta; Hooghly Ink Co. Ltd., 433, Grand Trunk Road, Howrah; and John Dickinson & Co. Ltd., 6, Clive Row, Calcutta.

559 N. B. R., Bombay—Following is a formula of eau de cologne. Bergamot oil 1 oz.; Lemon oil ½ oz.; Rosemary oil 2 dr.; Neroli oil 30 mins.; Lavender oil 4 dr.; Orange oil 2 dr.; Rectified spirit 2 lbs. Mix the ingredients one by one with brisk shaking. Set the whole aside in a stoppered vessel for a fortnight. During this period shake the vessel thrice daily. Finally filter and pack.

560 Q. D. R., Ahmedabad—Following is a process of manufacturing nicotine: Infuse tobacco leaves 4 hours with warm water slightly evaporate to a syrupy fluid add carbonate of soda in excess and shake out the alkaloid with ether. Separate the ether and shake it with a dilute solution of tartaric acid; remove the acid solution and evaporate to a small to the solution and distil in a current of hydrogen. On cooling the distillate the nicotine separates in oily drops.

561 R. L. B., Farrukhabad—Following is a process of making magic writing slate: Cardboard is coated with the following composition and covered with a sheet of waxed or oiled paper or cellophane. When the letter is written on with a stylus or pencil the writing appears. When this sheet is lifted away from the coated cardboard the writing disappears. Beeswax 4 parts; Venice turpentine 9 parts; Lard 4 parts; China clay 3½ parts; Carbon black 1 part; Mineral oil 2 parts. The consistency may be varied by varying the proportions of liquid in the formula.

562 A. C. L., Samalkot—Granite may be used as grinding stone. You may also break and grind it into powder form and use as emery powder.

563 R. M. D., Dehra Dun—Following is formula of antiseptic mouth wash: Thymol parts; Peppermint oil 10 parts; Clove oil parts; Murjaram oil 3 parts; Sassafras oil 3 parts; Wintergreen oil ½ part; Coumarin ½ part; Diluted alcohol 1000 parts. Mix. Use 1 spoonful in half a glass of water. All the chemicals may be had of Calcutta Chemical Co. . 10, Bonfield Lane, Calcutta and Butto Paul & Co. Ltd., 1 & 3, Bonfield Lane, Calcutta.

564 R. B. L., Madras—Bleaching of coconut fibre can be effected by the process of Dhobies' bleaching. Soak a quantity of fibre in a solution of fullers earth and chunam and have it curing. Then cover this fibre over a steam bath and generate steam by applying heat at the bottom of the pot containing water. If the fibre is left in steam for three hours the colouring matter will be acted upon and when the fibre is rinsed in cleaned water it will become white. This can be used for preparing high grade articles such as hats, etc.

565 S. C. R., Kanpur—Following is a process of manufacturing artificial leather cloth: Heat for 1 hour over a moderate fire 15 parts of powdered litharge, 15 of pulverized brown umber, and 2 of manganic hydrate with some linseed oil; then add 500 parts of linseed oil to the mixture and let the whole stand for a few days to settle. It is then thoroughly mixed with an equal volume of water and applied to linen, cotton, or woollen tissues and allowed to become dry. Now mix clear linseed oil with lamp black to a stuff paste and spread it on the tissue. If the latter is very thin or the coating required to dry quickly, the linseed oil must be boiled with the above-named substances for 2 or 3 hours to acquire the proper consistency. A paste made of 15 parts of plumbic salt and some turpentine and lampblack to 1000 parts of linseed oil is spread over the first coating and allowed to dry. Successive applications of linseed oil follow until the surface is suitable when it is smoothed with pumice. Mix linseed oil with lamp-black or other colouring matter, and paint the surface, allow it to dry, and pumice. Coat with a varnish of 1000 parts of linseed oil, 57 of umber, 5 of litharge and 5 of berlin blue, boiled for 24 hours and when cold mixed with turpentine. After the coat varnish is dry the appearance of Morocco is given to the fabric by subjecting it to pressure from engraved rollers. The material, which is already manufactured in large quantities, is soft, pliable perfectly waterproof and particularly well adapted for saddler and trunk-makers work, fancy articles, etc.

566 B. P. A., Dhanbad—Following is a method of making graphite crucible: Graphite 2 parts; fire clay 1 part; water q.s. First grind the graphite and sift. Then mix it with the fireclay and sufficient water to render it plastic. Now press it in metallic moulds. Allow the moulds and their contents, to dry in a stove or slow oven. In a short time, from the contraction of the clay in drying, the crucibles may be removed, and the moulds as soon as they become dry, may be again filled.

567 P. K. R., Allahabad—Following is a list of jute mills: Adamjee Jute Mills Ltd., Stephen House, 5, Dalhousie Square; Bharat Jute Mills Ltd., 29, Strand Road; Hooghly Jute Mill, Garden Reach; Ludlow Co. Ltd., 7, Royal Exchange Place; Luxmi Jute Mills Ltd., Belliaghata; Soorah Jute Mill, 102, Narkeldanga Main Road and Shree Ganesh Jute Mills Ltd., 43, Sir Hariram Goenka Street; all of Calcutta. An

exhaustive list of jute mills will be found in Industry Year Book and Directory published from this office, price Rs. 17/- including postage.

569 B. R. S., Calcutta—**Following is a** recipe of effervescent powder: Sugar 4 lbs.; Tartaric acid 2 lbs.; Sodium bicarbonate 2 lbs.; Lemon oil 2 dr. A water soluble dye may be used for colouring (about ⅜ gr. to 1 lb.), the solution of the dye being mixed with the sugar. The flavours may be varied as follows: Vanilla colour—by adding 2 p.c. vanillin per lb.; Almond 5 mins of essential oil of almond per lb.; fruit flavours—by the addition of 1 dr. of concentrated fruit essences per lb.

570 M. K., Cuttack—For practical training in perfumery and cosmetics write to P. C. Bhattacherja, 16/1, Nandalal Bose Lane, Calcutta-3 and M. N. Mitter, 79/4/2D, Raja Nabakissen Street, Calcutta-5.

571 P. S. D. B., Calcutta—Lamps of different varieties are manufactured by Silpa-Peeth Ltd, 111/1, Gopal Lal Thakur Road, Calcutta; Ujjala Lantern Works, 10, Hastings Street, Calcutta; A. K. Sarkar & Co., Barrackpur Trunk Road, Baranagar, 24 Parganas; Eastern Hurricane Mfg. Co. Ltd., 1, British Indian Street, Calcutta; Jay Engineering Works Ltd., 183-A, Prince Anwar Shah Road, Calcutta; Ogale Glass Works Ltd., Ogalevadi, Satara; Oriental Metal Industries Ltd., 34, Chittaranjan Avenue, Calcutta; and T. E. Thomson & Co. Ltd., 9, Esplanade East, Calcutta.

573 C. J. P., Illinois—Medicines for asthma and rhumatism may be had of Kalpataru Ayurvedic Works, Kalpataru Palace, 233, Chittaranjan Avenue, North Calcutta and Banga Luxmi Ayurved Works, Chowringhee, Calcutta.

574 R. S. S., Arrah—Electrical goods may be had of Edison Power Plant Co. Ltd., 34, Ezra Sreet; Biswas Trading Co., 55-58, Ezra Street; Metropolitan Electric & Engineering Co., 22, Ezra Street; P. Chattarji & Co. Ltd., 53, Ezra Street; Doshi Trading Co., 44-45, Ezra Street and M. L. Sinha & Co. Ltd., 50, Ezra Street; all of Calcutta.

575 R. B. M., Almora—Following is a process of bleaching wool: First of all wash the wool thoroughly with soda ash and soap in the ordinary way. Then immerse the wool in a cold bath consisting of 2 lbs. of hyposulphite of soda dissolved in 11 gallons of water. Keep the wool there for an hour and then take it out. Next pour 6½ lbs. of hydrochloric acid (conc.) into this bath and again immerse the wool in it and allow it to remain there for another one hour The vessel containing the wool must be **well covered during the last treatment and the bath must be large enough to conveniently handle the wool in it. The wool thus bleached** keeps for a longer time.

576 P. K. R., Jabalpur—**Following is a** process of making whetstone: **To make artificial whetstone take gelating of good quality dissolve it in equal weight of water, operating in almost complete dustless, and add 1½ per cent of bichromate of potash, previously dissolved.** Next take about 9 times the weight of the gelatin employed of very fine emery or fine powdered gun stone, which is mixed intimately with the gelatinized solution. The paste thus obtained is moulded into the desired shape, taking care to exercise on energetic pressure in order to consolidate the mass. Finally dry by exposure to the sun.

577 L. R. J., Patna—Following is a list of gramophone dealers: Bengal Musical Mart, 24, Moti Sil Street; Britannia Talking Machine Co. (Calcutta), 184, Dharamtala Street; C. C. Saha Ltd., 170, Dharamtala Street; N. B. Sen & Bros., 11, Esplanade East; N. C. Chandra 90, Bowbazar Street and Senola Musical Products Co., 183-2, Dharamtala Street; all of Calcutte. Following is a list of radio dealers: K. C. Dey & Sons, 161-1, Harrison Road; C. C. Saha Ltd., 170, Dharamtala Street; City Radio Stores, 3, Mangoe Lane; G. Rogers & Co., 12, Dalhousie Square; General Electric Co. (India) Ltd., Magnet House, Chittaranjan Avenue; all of Calcutta.

578 M. L. A., Bombay—Following is a process of preparing thymol: In order to prepare thymol from ajowan seeds a stout distilling vessel of cast iron is fitted with a condenser and receiver. A fairly large quantity of ajowan seed is put into the vessel according to its capacity and a quantity of water is then poured to cover the seeds just immersed in it. In heating the oil of thyme is distilled over. It is condensed and collected in a receptacle placed in the further end of the condenser. The oil is then separated from this volatile oil by shaking the latter with an equal volume of warm sodium hydroxide solution (sp. gr. 1.33) and after several hours the mixture is diluted with 2-3 volumes of hot water. The aqueous portion, which contains the thymol in solution in the form of its sodium salt is separated and acidified. The precipitated thymol is dried and distilled at 220—235C is seeded with a crystal of pure thymol and set aside in a cold place. The crystallised thymol is separated by filtration and purified by recrystallication from petrol.

Export and Import Regulations

EXPORT OF COPPER AND BRASS MANUFACTURES OF INDIAN ORIGIN

The following Trade Notice No. G/12/54, dated the 6th January 1954, has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

In continuation of the Office Notice No. G-167/53, dated the 16th July 1953, on the above subject, it is hereby notified for information of the trade that export of copper and brass manufactures including utensils but excluding sheets and other semi-manufactures will continue to be licensed freely to all permissible destinations during the period January-June, 1954.

2. No formal licence will be issued. Licensing will be done on shipping bill which should be accompanied by application in the prescribed form, quoting therein the current Income-tax Verification Certificate Registration or Exemption Number, as the case may be, and Treasury Receipt in token of having deposited the requisite licence fee.

EXPORT OF PAINTS, VARNISHES AND ENAMELS, ETC.

The following Trade Notice No. G/20/53, dated the 8th January 1954, has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

In continuation of this Office Notice No. G/187/53 dated the 4th August, 1953, it is hereby notified for information of the trade that export of indigenous pastes, readymixed paints, enamels and lacquers containing zinc oxide, white lead or red lead will continue to be licensed freely to all permissible destinations upto the end of June, 1954. Licensing will be done on shipping bills which shoud be accompanied by application in the prescribed form with valid Income tax Verification Certificate Registration/Exemption Number as the case may be and Treasury Receipt for the appropriate value.

EXPORT OF INDIGENOUS SPECTACLE FRAMES

The following Trade Notices No. G/21/54 dated the 8th January 1954, has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

It is hereby notified for information of the trade that spectacle frames manufactured in India will be licensed freely for export to all permissible destinations.

2. Licensing will be done on shipping bill which must be accompanied by application in the prescribed form with valid Income-tax Verification Certificate Registration Exemption Number, as the case may be, and Treasury Receipt for the requisite amount.

EXPORT OF FILTER CLOTH

The following Trade Notice No. G/14/54, dated the 7th January 1954, has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

In continuation of this Office Notice No. G/253/53, dated the 9th October, 1953, on the above subject, the trader is hereby informed that the Government of India have decided to extend free licensing of filter cloth to all permissible destination other than Tibet, Portuguese and French Possessions in India for shipment till the 31st March 1954.

2. Licensing for export of mill made filter cloth, which was valid upto the 31st December 1953, will aso be extended upto 31st March, 1954, if so desired.

EXPORT OF DRIED VEGETABLES

The following Trade Notice No. G/17/54, dated the 7th January 1954, has been issued by the Joint Chief Controller of Imports and Exports, Calcutta :—

It is notified for information of the trade that export of dried vegetables will be licensed freely to all permissible desintations up to the 31st March 1954. Licensing will be done on presenation of shipping bill duty supported by application in prescribed form, quoting therein current valid Income-tax Verification Certificate Registration or Exemption Number, as the case may be, and Treasury Receipt of requisite amount as licence fee.

EXPORT OF SILK WASTE

The following Press Note, dated New Delhi, the 15th January 1954, has been issued by the Government of India in the Ministry of Commerce and Industry :—

In a Press Note, dated March 12, 1953, the Government of India had announced that exports of silk waste of West Bengal, Bihar and Assam origin would be licensed freely for shipment upto December 31, 1953. Pending finalisation of the export policy to be adopted during 1954, the Government of India have decided to extend the free licensing of silk waste of West Bengal, Bihar, Assam and Madhya Pradesh origin for shipment upto March 31, 1954. Shipments will be allowed only from the port of Calcutta as hithertofore.

Tender Notices

SUPPLY OF BRASS BARS

Office of Issue :—The Directorate General of Supplies and Disposals (Railway Stores Directorate), New Delhi.

Tender No. P/SNI/17207-D/303/IV.53.

Due by 10 a.m. on the 18th February 1954. Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Brass Bars, hexagonal and round ..	559 cwts.
Price per tender set	..	Rs. 8-0.

SUPPLY OF ELECTRIC MOTOR, ETC.

Office of Issue :—The Directorate General of Supplies Disposals, Shahjahan Road, New Delhi.

Tender No. SEI/26211-D/V.

Due by 10 a.m. on the 18th February 1954. Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Electric Motor D. C., 50 H.P. and Starter as per Specification GCF/5.RR/53-54 ..	1 No.
Price per tender set	..	Rs. 2-0.

SUPPLY BATTERIES

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. SEI/26096-D/III.

Due by 10 a.m. on the 26th February 1954. Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
	Batteries, 6 Volts—	
1. 17-B-8652.	Amps— 106 AH at 10 hrs. 120 AH at 20 hrs. having dimensions L. 10½", W. 8¼", H. 9½".	1,400 Nos.
2. AE-31159.	90 AH at 10 hrs. 100 AH at 20 hrs. having dimensions L. 10-9/16", W. 7⅛", H. 8½". ..	6,000 „
3. AE-31328A.	Batteries, 12 Volts— 177 AH at 10 hrs. 200 AH at 20 hrs. having dimensions L. 21⅞", W. 11", H. 10-9/16" with handle. ..	1,300 „
4. AE-31331A.	Batteries, 6 Volts— 297 AH at 10 hrs. 336 AH at 20 hrs. having dimensions L. 25½", W. 7½", H. 11-9/16" ..	380 „
Price per tender set	.. ..	Rs. 10.

SUPPLY OF INJECTOR

Office of Issue :—The Directorate General of Supplies and Disposals, New Delhi.

Tender No. P/SW2/18635-D/11.

Due by 10 a.m. on the 26th February 1954. Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Injector 5 M/M Gresham JJ type ..	50 Nos.
Price per tender set	.. ..	Rs. 7-4-0.

SUPPLY OF POWER SIGNALLING EQUIPMENT

Office of Issue :—The Directorate General of Supplies and Disposals (Engineering Stores Directorate), Shahjahan Road, New Delhi.

Tender No. SEI/19893-D/V.

Due by 10 a.m. on the 10th March 1954. Sealed tenders are invited for—

Item No.	*Description of Stores.*	*Quantity.*
1.	Ref. No. F2b/NS-Point Contractor Relay Shelf mounting 12 volts D. C. with 1 overload and 1 cross protection Relay. .. Specification. — SGE Cat. No. CV 12001 GRS Cat No. 507/16 Type AI or similar.	4 Nos.
2.	Ref. No. F2b/NS-Leakage Indication system, suitable for single phase 110 volts, 50 cycles A. C. supply, require to operate when insulation of each line falls below 3 Megohms, comprising of the following :— .. (a) Leakage Indicator Unit containing the transformers, rectifiers and fuses. .. (b) D. C. Relay, style D-one for each i.e., BX & NX. .. (c) Light Indicator Globe Type for fault indication duly engraved as line 1, line 2 or similar. .. Specification.—W. B. B. S. Cat. Sec. G. Page 14 or similar.	2 sets.

INDUSTRIAL PRODUCTION

Industries		1952	Jan., to Sept., 1952	Jan., to Sept., 1953*	August, 1953*	Sept., 1953*	Sept., 1952
Major Industries.							
Coal	lakh tons	362.22	271.3	270.70	27.47	29.72	27.65
Steel	lakh tons	15.78	11.66	10.78	1.00	1.03	1.31
Yarn	million lbs.	1,448.30	1,065.1	1,127.9	130.0	129.0	123.6
Cloth	million yds.	4,603.20	3,397.4	3,709.7	421.0	407.0	392.6
Cement	lakh tons	35.27	26.1	27.45	3.07	3.11	3.09
		952	724	655	68	73	70
Paper	tons	1,37,504	1,02,287	1,05,009	12,400	12,443	11,859
Matches	cases	6,08,200	4,52,000	4,56,700	44,200	46,700	46,500
Sugar	lakh tons	14.19	11.80	10.58	—	0.02	0.69
Engineering and Electric Industries.							
Machine tools	value in lakhs of Rs.	44.37	35.74	33.27	3.00	4.16	3.14
Electric lamps	lakhs	208.81	152.95	149.14	15.17	16.53	14.09
Dry cells	crore Nos.	13.02	9.44	10.85	1.33	[illegible]	1.15
Transformers	k.v.a.	2,14,800	1,51,200	2,27,500	26,700	27,600	18,900
Motors	h.p.	1,57,600	1,19,400	1,28,000	13.100	13,3[illegible]	13,500
Electric fans	Nos.	1,95,500	1,62,400	1,61,900	18,500	18,500	11,700
Radio receivers	Nos.	71,495	55,651	42,110	3,405	4,730	6,963
Storage battery	Nos.	1,58,400	1,30,400	1,31,100	16,000	16,400	13,000
Cables and wires—							
Copper conductors	tons	5,928	3,371	5,801	296	217	810
Winding wires	tons	398	297	171	11	13	27
Rubber insulated cables and flexibles	lakh yds.	328.6	234.80	368.8	45.6	35.6	25.0
Insulators—							
H. T.	Nos.	3,25,000	1,88,200	3,85,900	52,100	47,100	21,400
L. T.	lakh Nos.	30.50	21.92	16.41	1.79	1.50	2.33
		4,248	3,627	1,947	353	440	187
Chemical Industries.							
Salt	lakh mds.	768.64	698.21	821.99	32.37	24.55	22.80
Caustic soda	tons	17,058	12,637	14,706	1,955	1,743	1 636
Soda ash	tons	44,322	30,279	41,752	4,411	4,642	4,695
Chlorine liquid	tons	6,240	4,452	5,573	757	752	559
Bleaching powder	tons	792	643	1,172	139	121	86
Bichromates	tons	1,463	1,083	1,609	191	190	130
Sulphuric acid	tons	96,081	66,890	71,922	8,270	8,170	9,580
Superphosphates	tons	46,650	39,495	27,000	3,307	3,670	3,345
Non—ferrous Metals—							
Aluminium	tons	3,566	2,905	2,531	271	305	205
Antimony	tons	181	160	83	—	—	10
Copper	tons	6,079	4,594	2,995	500	608	375
Lead	tons	1,132	824	1,169	145	171	105
Miscellaneous (Minor) Industries.							
Sewing machines	Nos.	50,045	36,928	4 5,147	5,047	6,180	2,858
Hurricane lanterns	lakh Nos.	35.23	26.54	32.21	4.29	3.44	2.47
Bicycles	Nos.	1,96,956	1,32,415	1,83,908	26,980	26,215	16,702
Cycle tyres and tubes	lakh Nos.	83.55	61.18	71.57	9.13	10.07	8.07
Motor tyres and tubes	lakh Nos.	13.83	10.97	11.02	1.42	1.44	1.17
Cigarettes	crore Nos.	2,058.85	1,517.54	1,474.24	156.30	156.47	164.86
Plywood—							
Tea chests	lakh sq. ft.	782.27	607.69	378.31	38.15	40.00	57.30
Commercial	lakh sq. ft.	122.58	87.62	95.33	6.97	8.00	9.25
Refractories	lakh tons	2.43	1.85	1.69	0.19	0.10	0.18
Abrasives	reams	55,600	35,500	42,200	3,600	5,100	5,400
Sheet glass	lakh sq. ft.	90.42	48.9	140.62	9.66	13.00	—
Woollen manufactures	lakh lbs.	166.68	111.03	122.69	16.22	12.63	16.55
Footwear—							
Western type	lakh pairs	33.67	25.71	25.42	2.80	2.89	3.21
Indigenous type	lakh pairs	18.06	14.67	16.40	2.03	2.23	1,43
Alcohol—							
Industrial	lakh galls.	68.45	50.11	45.72	4.78	7.72	5.02
Power	lakh galls	77.42	58.98	61.29	5.32	5.75	4.43

* Figures are subject to revision month to month.

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Industry

MONTHLY MAGAZINE

FORTY FOURTH YEAR OF PUBLICATION

CONTENTS FOR MARCH ISSUE

March issue will contain useful articles on industrial and technical subjects such as The Manufacture of Ebonite Articles; Canning and Preserving Fish; Coating of Noble and Rare Metals; Reclaiming Scrap Rubber, etc. in addition to the regular features such as Agricultural Tips; Scientific Researches and Inventions; Engineering Notes; The Business World; Official India; Pharmaceutical Recipes; Recipes for Small Manufacturers; Formulas, Processes and Answers; Reader's Business Problems and Queries and Replies.

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BUSINESS EFFICIENCY

Business efficiency is the keynote to success. It quickens the mind of businessmen to recognise the absolute necessity of introducing efficiency in their staff, their organisation, their administration and their technique.

India is becoming business-minded. More and more is business drawing the educated middle class Indians who a generation ago had a traditional contempt for trade. The services and mercantile firms were the avenues of bhadralog subordinate employment. The pittance they drew and the humiliations they suffered are notorious. Economically they were no better than slaves and their serfdom was and is no better than the serfdom of the old galley gangs, who were whipped with thonged lashes to row. In the case of Indian clerks and sub-ordinates the thonged whip is penury. The progressive economic distress of India's middle class, cream of her population, is written in flaming letters on the lintal of every middle class home.

Disillusion has come. A country is not ennobled or enriched by servitude of subordinate service. There is one way and one way only to reconstruct India's economic structure; that way is business. This is an outstanding fact and it is astounding that it has not been implemented in this country as yet.

We believe on the evidence of public appreciation that business efficiency is popularising business : not on haphazard lines, but on modern methods of efficiency. Without efficient management and service business must be a failure. This fact is the beacon light of this article. Indian business has to be founded and built on the rock of efficiency if it is to be an economic power both at home and abroad. The post war period is a testing time for all business and those only that are equipped with efficiency will stand the test. Already there is a scramble by foreigners to capture the Eastern markets of which India and China are most important.

The national force behind the awakening of educated Indians to take to business as a career is the consciousness of its nation-building quality. The awakening is belated; but its current is swiftly gathering volume and velocity. To-day the surge is heading to the upper reaches of profitable business. Ambitious young India as well as patriotic young India are abandoning the easy way of clerkdom for the hard way of business. They are shedding the subordinate service complex. They are taking to business for the competence denied to clerks.

Industries ancillary to war requirements have grown in the wake of war. Imports except war materials dwindled to vanishing point. The daily needs of India's four hundred millions were partly met by Indian production. That is a factor which places India in a privileged post-war position. Strenuous efforts are being made to exploit India by American and British capital. Were Indian business men to become efficiency-minded there is enough capital in the country to put India's entire business on a national basis. It is truly said that Indian capital is shy of business : the reason is that Indian business founders in inefficiency. Remove the reason and Indian capital will pour into India's business.

Not in big business, though that has its commanding prestige, but in country-wide expansion of small business that serve the local market lies India's economic well-being. While other sequelae of war are doubtful and debatable, a new economic order is certain. Indian-business men must prepare themselves to fit into that order : the only preparation is efficiency and still more efficiency in business.

There was once an apprehension that the flood of war business would with the end of war recede into a disastrous ebb. That apprehension is liquidated. There is concensus of opinion that post-war has in its reconstruction stage ushered in intense commercial activity.

The Railway Budget

Shri Lal Bahadur Shastri, Railway Minister, presented a surplus budget for the railways of Rs. 5.14 crores for 1954-55 after providing for a contribution of Rs. 35.5 crores to the general revenues.

He announced no revision in the passenger or freight rates but indicated Government determining certain adjustments in fare and freight rates structure.

The overall estimates for gross receipts have been placed at Rs. 273.25 crores, in 1954-55 against Rs. 372.0 crores in the revised estimates for 1953-54.

The total expenditure in the budget year 1954-55 amounts to Rs. 268.11 crores thus leaving a surplus of Rs. 5.14 crores.

The railway budget makes record provision of Rs. 95 crores for rehabilitation and development programme. It also makes provision to encourage indigenous manufacture. It also announces certain travel concessions although the Railway Minister had not found it possible to offer at present any relief in the matter of freights and fares generally.

Referring to the progress made by railways under the Five Year Plan the Minister said that arrangements had been made to step up expenditure on works and also to increase the procurement of rolling stock during the remaining two years of the Plan so as to ensure that the target expenditure of Rs. 400 crores was reached.

He said that emphasis in the improvement of passenger amenities would be placed during the budgest year on smaller and wayside stations.

The Minister said that the revised estimate of surplus for the current financial year was Rs. 3.18 crores as against Rs. 9.31 crores estimated in the budget. The fall was mainly due to an increase in the working expenses on account of the acceptance of the recommendations of the Gadgil Committee to treat 50 per cent. of the dearness allowance paid to the employees as pay, which involves an additional expenditure of about Rs. 3 crores annually, and to the increased diversion of coal by sea for the Southern, Central and Western Railways.

Certain financial and accounting changes were proposed to be introduced with effect from April 1, 1954 to assess the financial results of the working of individual zonal railways.

PASSENGER EARNINGS

The budget estimate of passenger earnings, he said, had been placed at Rs. 101.51 crores which is nominally higher than the revised estimate but slightly lower than the original estimate for the current year.

As regards goods earnings, he said, there were reasons to be more optimistic on account of increasingly encouraging trends of industrial production. The forecast of agricultural production was also reassuring. He had, therefore, placed goods earnings at Rs. 148.6 crores, or one per cent. higher than the revised estimates for 1953-54.

The overall estimate for gross receipts had thus been placed at Rs. 273.25 crores against Rs. 272.0 crores in the revised estimates for 1953-54.

The ordinary working expenses for 1954-55 had been placed at Rs. 3.32 crores lower than the revised estimate for the current year. The appropriation to the Depreciation Reserve Fund had been maintained at the same level as in the current year, viz. Rs. 30 crores. After providing for a net miscellaneous expenditure of Rs. 8.08 crores and a dividend of Rs. 35.50 crores to the general revenues,

he surplus expected to accrue in 1954-55 ıad been placed at Rs. 5.14 crores.

HIGHER EXPENSES

The Railway Minister referred to "the rend of continued increase in the working :xpenses of the Railways and the progres-ive diminution of the Railway surplus," and said: "Although there has been a slow mprovement of the position, I cannot see n the present conditions any indications to expect in the near future a market spurt n passenger traffic.

At the same time working expenses have been going up owing to factor over which we have but little control. The budget estimates for 1954-55 show an increase of nearly Rs. 50 crores over that for 1948-49. Except for a sum of 10 crores which is due to the taking over of the State Railways, the bulk of this increase is attributable to the liberalisation of benefits to staff. The fuel bill accounts for an increase of about Rs. 7 crores. This is consequent on expansion of services to meet the demands of traffic.

FIVE YEAR PLAN

In a brief reference to the progress made under the Five-Year Plan, the Minister said that the Railways actually spent Rs. 131.04 crores during the first two years of the Plan period and a sum of Rs. 77.88 crores was likely to be spent during the current year, leaving a balance of about Rs. 191.08 crores out of Rs. 400 crores allowed to the Railways under the Plan. He said that arrangements had been made to step up expenditure on works and also to increase the procurement of rolling-stock during the remaining two years of the Plan so as to ensure that the targets were reached.

Giving details regarding the progress of development works the Minister said, satisfactory progress was being made on the Champa-Korba line and work on the Gandhidham-Kandla link had already commenced. Work was expected to start in the near future on the Khandwa-Hingoli, Gop-Katkola and Gua-Manoharpur lines.

Referring to other constructions, he said, the Chunar-Robertsganj line was being shortly opened for goods traffic and was expected to be ready for passenger traffic by May, 1954. The diversion of the Railway line via Chandigarh had been completed, as also the Budni-Barkhera double line. A portion of the Sanganer Town-Toda Rai Singh Extension had been completed and opened for traffic. The Madhepura-Murliganj line was expected to be completed during 1954-55. Out of the 96 miles of the Quilon-Ernakulam Railway, the Ernakulam-Kottayam Section, 37 miles long, was expected to be opened for traffic in 1955.

GANGA BRIDGE

Agreements for the collection of materials and equipment required for the construction of the Ganga Bridge at Mokameh and the ancillary training works had also been completed.

As regards the dismantled lines, the Minister stated that the following had been restored during the current year :—

(i) Shoranur - Amgadipuram (part of Shoranur-Uilambur). (ii) Vasad-Kathana. (iii) Balamau-Mahoganj (part of the Unao-Madhoganj). (iv) Madura-Usilampatti (part of Madura-Bodinayakanur).

In addition, the restoration of the Nagrota-Jogindernagar and Bhagalpur-Mandarhill branches had been almost completed and they would be opened for traffic shortly.

Coming to the Budget estimate of the expenditure on Works, Machinery and Rolling Stock the Minister stated that Rs. 95 crores were to be spent during 1954-55 which is the highest amount ever proposed. The budget estimates for works provided for an increased outlay of about

17 per cent. over the revised estimates for 1953-54 and about 44 per cent. over the actuals for 1952-53.

The provision made for rolling stock required a heavier procurement programme than in the past. Orders for a large number of locomotives were placed abroad recently to accelerate the rehabilitation of railways.

During the Plan period, it is expected that a total number of about 1600 locomotive would be received. This should result in an overall improvement in the power position of the railways. The Minister acknowledged the assistance from Canada under the Colombo Plan for supply of 120 broad gauge passenger locomotives and from the United States Government under their foreign aid programme for 100 broad gauge locomotives.

INDIGENOUS RESOURCES

The Minister said that the objective of utilising indigenous resources to the maximum extent continued to guide and regulate all orders. It was his intention to step up the production target of the Chittaranjan Locomotive Works from 120 to 150 and thereafter to 200 average-sized locomotives in the course of the next four years. The Tata Locomotive and Engineering Company had so far produced and delivered 50 locomotives in all, but they were expected to reach their target of 50 locomotives a year in 1954-55.

As regards wagons, practically all the increased procurement had been planned on indigeneous production. New manufacturers had come into the field and established manufacturers had agreed to expand their production capacity. Orders for about 11,000 wagons were being placed against the 1954-55 programme with manufacturers in India. The Minister said that 500 wagons were also expected to be received under the foreign assistance programme of the Government of United States.

The policy of not placing new orders for passenger coaches abroad was being continued this year. The capacity of the Hindustan Aircraft Limited and of railway workshops was being stepped up. The construction of the Integral Coach Factory at Perambur was making satisfactory progress, and coach body-shells would start coming out during the second half of 1955.

The Minister said that he had decided to set up a committee to advise how the manufacture of certain special types of wagons, narrow gauge locomotives and other stock and fittings, which were still being imported, could be established in the counrty.

He hoped that the Indian industry would rise to the occasion and take to the manufacture of specialised railway items in increasing numbers.

NEW MAJOR WORKS

The Minister said that in 1945-55 it was proposed to concentrate on the execution of the works already in hand although certain new major works would also be undertaken. A major project that had been included was the electrification of the suburban services in the Calcutta area and work on the electrification of the Howrah-Burdwan main line section of the Eastern Railway would commence forthwith. Provision had also been made for a traffic survey for rail connection the Garo Hills in Assam. In addition the construction of the Pathankot-Madhopur broad gauge line, 7.06 miles in length, was proposed to be undertaken to facilitate movement to Jammu and Kashmir State. The line was estimated to cost about Rs. 35 lakhs.

Proposals for new constructions under examination include the Indore-Ujjain broad gauge line, rail connection to Etah, the Mangalore-Hassan, the Diva-Dasgaon, the Teldanga-Khajuria-Malda, the

Bhavnagar-Tarapur and the Fatehpur-Churu lines. The question of providing electrification for the operation of the Quilon-Ernakulam line was also under consideration. Extention of electrification to Tambaram Villupuram section of the Southern Railway was receiving attention.

Work for augmenting the line capacity in congested sections was being programmed on a larger scale, Rs. 3.1 crores having been provided in the budget year against Rs. 2.1 crores in the current year. Special attention is being paid to the following:—

(i) Siliguri-Alipur Duar section of the Assam Rail Link, the capacity of which is proposed to be more than doubled;

(ii) Bezwada-Madras section of the Southern Railway including the remodelling of the Bezwada yard and the conversion of Gudu-Renigunta Section from metre guage to broad gauge. The capacity of the section will be increased from 300 to 420 wagons per day.

(iii) Central India Coalfields via Katni-Marwara, where movement will be stepped up from 265 to 350 wagons per day.

(iv) Via Chheoki on the Central Railway, where movement is proposed to be increased from 190 to 240 wagon per day.

(v) Raichur - Arkonam Section, for running additional goods trains.

(vi) Anara-Jaychandi Pahar-Burnpore section and Sini-Gomharria section, the doubling of which is being carried out for the movement of raw materials for increased production of steel.

CONVENTION COMMITTEE

The Minister said that he would invite the house during the present session to set up a committee to go into the question of the rate of dividend payable by the Railways to general revenues of the Central Govt. Such a review was provided for in Resolution passed by the Constituent Assembly (Legislative) in 1949 defining the relationship between railway finance and general finance.

The Minister said that considering the vast areas which were awaiting economic exploitation through the introduction of satisfactory transport facilities, he felt that it was necessary to adopt a bold policy of development and expansion of the railways. But the prospects of increased financial resources were none too bright. Against Rs. 320 crores to be contributed by the Railway for the execution of the Five-Year Plan, the contribution for the first three years was likely to be Rs. 165 crores only and a short-fall of about Rs. 60 crores was expected during the Plan period.

The Railway Minister further said: "I am examining in the above context the implications and practicability of certain suggestions for adjustments in our fare and freight rate structure which is claimed are necessary for a developmental economy."

He said that there was also the need for maintaining and, if possible, accelerating the space of construction of new lines. The present high levels of the cost of materials and labour involved unremunerative investment at least for some time to come. The balances in the Development Fund were rapidly dwindling. He observed:

"The only way in which new construction seems to be possible is to provide for a recover of charges on the basis of inflated mileage for a limited period so that the projects may not be burdensome. The device may also profitably be adopted in cases where a shorter route is provided reducing the cost of transportation substantially, the whole of which need not be passed on to the consumer."

OPERATIONAL PERFORMANCE

The Minister said that the punctuality of trains further improved during 1953.

The resources of all the Railways were pooled to make arrangements for the Prayag Kumbh Mela; 374 special trains were run to the Allahabad area to cope with the inward mela traffic, while 344 specials were run to clear the Mela traffic up to February 6, 1954. In addition, 510 shuttle trains were run within the Mela area to facilitate local movement of pilgrims.

The revised procedure for movement of commodities introduced in August 1953, had so far worked satisfactorily.

An Efficiency Bureau had been set up in the Railway Board to investigate and eliminate outmoded and costly practices and to evolve suitable techniques for achieving efficiency and economy in diverse fields of railway operation and management.

As regards the working of the regrouped railways the Minister said that the data available was only for a limited period which did not permit of reliable comparison being made. Some more time must elapse before a correct assessment of the position could be made. The accounting changes to be made from 1st April, 1954, would also enable the financial results of each zone being ascertained.

SMALL STATIONS

Referring to the systematic policy followed by the Railways to improve amenities for passengers, the Minister said that it was his intention in the budget year to see, that more of these amenities were provided at small and wayside stations. The amenities include provision of improved platform and waiting facilities, electrfication, improved lighting and foot overbridges etc. at a large number of stations. representative Amenities Committee had also been set up on each Railway.

Shri Shastri said that the fears entertained in some quarters about the effects of the abolition of first class on Railway earnings had proved to be without foundation. Moreover, with the abolition of first class, it had been posible to increase the lower class accommodation.

Shri Shastri said that it was the Railway Ministry's object to reduce, as far as possible, the difference that existed to-day between the lower and higher classes. The new third-class coaches were an appreciable improvement on the old ones. Wider seats, fans, better lights and improved lavatories had been provided. New coaches were being manufactured keeping this standard in view.

Efforts had been continued to reduce overcrowding in passenger trains. Between April, 1953, and November, 1953, 190 new trains were introduced and 126 trains extended. During 1952-53, 184 broad gauge and 135 metre gauge third-class coaches were put on the line. While the numbers of the third class passengers decreased from 1163 millions in 1951-52 to 1120 millions in 1952-53, the number of seats provided for third-class passengers increased from 856,000 to 864,000 over the same period. The position was expected to improve further.

The previous year's improvement in regard to the disposal of compensation claims had been maintained.

Definite steps had been taken to improve the watch and ward and the security organisations on the Railways. It was proposed to appoint for each zonal Railway a security officer of the rank of a Deputy Inspector General of Police who would have direct access to the General Manager. The Home Ministry, too, was considering measures to co-ordinate action with the Railways in this connection.

In order to secure better representation of the vast body of railway users. National, Zonal and Regional or Divisional Railway users' consultative committees had been set up.

INCIDENCE OF ACCIDENTS

In making a reference to the recent accidents to passenger trains the Minister said: "The occurrence of these accidents within a short time has been an unfortunate coincidence, but it should not cause any undue apprehension or alarm." It was, however, the duty of the administration to remain vigilant and to see that the incidence of accidents is kept down. To achieve this objective, a committee had been set up which had already started its work.

A Hindi section had been opened in the Railway Board's office to deal with Hindi correspondece and help in the translation of official documents and other papers. A standardised nomenclature of different terminologies in use on the Railways was being progressed, and he had directed that this sholud be as simple as possible. Railway adminstrations were also setting up machinery to reply in Hindi to Hindi letters received in their offices.

The Railway Research and Testing Centre at Lucknow with subcentres at Chittaranjan and Lonavala, had started doing useful work and he hoped that this would lead among other things to more economical designs of permanent-way.

The value of stores balances further came down from Rs. 63.41 crores on March 1953, and a further reduction of Rs. 4 crores was anticipated by the end of 1954-55.

USE OF KHADI

The Railway Board had issued instructions early this year to extend the use of khadi on the Railways.

Two more Railway Service Commissions had been set up with headquarters at Allahabad and Madras to facilitate recruitment of staff from regions covered by the Commissions.

The Minister said that a commitee for conducting an enquiry into the prevelance of corruption on the railways was set up in September, 1953. Its Chairman, Pandit Kunzru, had been appointed members of the States Reorganisation Commission, and the committee had to lose his valuable services. He announced that Acharya J. B. Kripalani had agreed to guide the deliberations of that committee as chairman.

TRAVEL CONCESSION

The Minister said that although he had not found it possible to offer at present any relief in the matter of freights and fares generally, the following travel concessions were being introduced:—

(i) Circular Tour Tickets for distances of 1,500 miles and over at concessional fares of ¾ the public tariff rates for second, inter and third classes. These concession tickets will apply not only to the standard circular tours notified by railways but also to circular tours suggested by parties themselves and approved by the Railways.

(ii) Round Tour Tickets for students available for 45 days at the usual concessional rates when they undertake tarvel in parties of not less than four instead of in parties of not less than ten as at present. The existing concession for educational tours in parties of not less than ten will also apply to such students travelling in parties of not less than four.

(iii) Students Concessional Monthly Tickets in non-suburban areas, for students proceeding daily from their homes to attend schools or colleges and returning therefrom. These monthly tickets will be issued from stations not more than 30 miles distant from the station of the payment of 12 single journey fares.

(iv) Concessional Hill Station return tickets at 1½ single journey fares to certain selected hill stations during April to October for second, inter and third classes, available for three months from all stations from which the chargeable distance is 150 miles or more.

Certain principles had been formulated for determining the seniority of the staff of the integrated railways, and the railway administrations had been instructed to frame seniority lists in accordance with these principles and to complete the work as expeditiously as possible. The procedure for filling selection posts had also been finalised.

Referring to the steps taken for housing of railway staff, the Minister stated that while the standard of amenities in some of the existing quarters was being improved, construction of 18,432 new quarters was expected to be completed during 1953-54 and 1954-55. Rs. 4.60 crores had been provided for the construction of staff quarters in the budget year as against Rs. .4 crores in the current year. The total provision for staff quarters and for staff amenities in the budget year was Rs. 5.84 crores. The Minister made a special reference to the decision to construct annexes to suitable sanatoria one for each zone so that railwaymen suffering from tuberculosis may get treatment nearer their homes. Provision of one annexe each on the Eastern and Southern Railways had already been made in the budget programme.

The machinery for negotiating with railway labour had functioned well at all levels, and many issues including complicated ones had been ironed out successfully. The Minister wished there were more frequent meetings and talks at divisional or regional and zonal levels to resolve problems at initial stages.

RELATIONS WITH LABOUR

Shri Shastri said that the railways had another year of very cordial relations between labour and management which augured well for the future. The two former railway federations had merged into a new organisation during the year, called the National Federation of Indian Railwaymen. This was a healthy development and would, he was sure, prove beneficial. "The passing away in tragic circumstances of Shri Hariharnath Shastri, who worked hard to bring this about, and whose selfless work in the cause of labour is well-known, has been a great loss which we all mourn," he said.

In conclusion, Shri Shastri referred to the obligations of railwaymen towards the users of the railways. There had been some improvement in the outlook of railwaymen in regard to their behaviour towards the public but he frankly felt that there was still much scope for improvement. He said that the entire attitude of railwaymen to the common men had to be changed whether he was a third class passenger or a small shopkeeper who wanted to book his parcels or goods.

The Fruit and Its Preparations

All fruit should be well ripened before it is canned. Unripe fruit is low in quality, the texture is hard, the taste is too acid, and the natural flavour and aroma have not developed. On the other hand if the fruit is much over-ripe it will crush easily and will not give an attractive looking package. Fruits that are in their prime condition to eat out of hand are as a general rule best for canning.

When fruits are being canned in sufficient quantity they should be graded for size, colour, and ripeness. Soft and over-ripe fruits should be discarded for use in jams, butters, or blended jellies.

PREPARATION AND HANDLING

All fruit from which the skin is removed or which is cut into pieces will discolour within a very few minutes if exposed to the air. This discolouration may be prevented by placing the peeled or sliced fruit in either a weak brine (one tablespoon salt per quart of water) or a light sugar syrup (1 cup sugar per gallon). The syrup may be strained after using and concentrated to be used as a part of the canning syrup.

Soft fruits like the berries should be washed just before packing. If allowed to stand long after washing they become soft and unfit for canning. Strawberries should have the calyxes or "hulls" removed before the fruit is washed.

PACKING THE FRUIT

Large fruits like plums, pears, and peaches must be placed in the jars rather than just "filled in" if a close and attractive pack is desired. A narrow-bladed spatula or a thin wood paddle will be found almost indispensable in placing and arranging fruits in the jars. The aim of the canner should be an honest economical pack, rather than just a showy pack.

Small fruits like berries and cherries are shaken down to form as close a pack as possible without crushing the fruit. The jar is filled, loosely, to the neck with these small fruits. It is then grasped about the neck and is struck downward on the palm of the other hand or on a folded cloth on the table two or three times. It is filled again and settled, after which fruit is added to fill the jar rounded full.

ADDING THE SYRUP

The syrup should be added as soon as the jars are packed. There are some distinct advantages in adding hot syrup: (1) There are fewer air bubbles left among the fruits, since the heated syrup expands the air, causing the bubbles to rise to the top of the containers; (2) the jar is warmed somewhat and may for safety be placed in the heated water in the processer.

If the syrup is added to within a half inch of the top of the container and if the container is then swiftly rotated first in one direction and then the other, the imprisoned air among the fruits will be expelled. Or a thin, flexible spatula may be used to release the imprisoned air. More syrup is then added to fill the jar full. It is highly essential that the packed jars shall be as free as possible from air bubbles before they are placed in the processer.

REMOVING PEEL OR SKIN FROM FRUITS

A few suggestions for removing the peel from some of the more important large fruits should be of interest, at least to the inexperienced.

Apples are peeled most rapidly by

use of a peeling machine. There are many kind of these, ranging from the single-fork kitchen peeler to the three-fork hand or power peeler and corer. Pears are as a rule not adapted to peeling on machines. hand peeling gives best results. Commercial canners use a knife with a curved blade having a guard to limit the thickness of the peel. These are very desirable since they give a smooth surface to the peeled fruit. If pears are to be canned in halves they may be most easily cored by using a pear corer or a potato ball cutter.

Peaches may be peeled with a knife. scalded, or lyed. Lye is the most economical way to remove the skin from the peach, provided one is handling as much as a bushel or more of fruit. The fruit is placed in a wire basket and lowered into a kettle of boiling lye solution (1 pound of ordinary concentrated lye per gallon of water) for 30 to 60 seconds or just long enough for the lye to remove practically all the skin but not long enough to soften the fruit. The fruit is immediately washed through several changes of water, or better if set under the running tap. A few minutes' washing to remove the lye and a little gentle rubbing to loosen adhering bits of skin will in a very short time peel a large amount of fruit. Fruit peeled in this way should be kept in a weak brine until ready to pack. If fruit is difficult to pit the pits should be removed before peeling, as this operation can be done more readily if the skins are on the fruit.

If preferred the fruit may be blanched in hot water just long enough to cause the skins to slip readily, after which they must be cooled at once in cold water.

Plums are most easily skinned by placing them in a wire basked or cheesecloth and dipping them into a kettle of boiling water just long enough to loosen the skins, than quickly cooling them in cold water to prevent unnecessary cooking of the pulp.

RECIPES FOR CANNING FRUITS

APPLES

Any good cooking apple, especially the fall and winter sorts, may be canned. Summer apples as a rule are soft and juicy and are best canned in the form of sauce. The fruit should be of good quality, well ripened but not mellow. Most varieties may be canned either in pieces or as a sauce, depending upon the use to be made of them. Each method of canning will be treated separately.

Canned Apples—Sliced.—The fruit is peeled, cored, and cut into thin slices: usually the quarters are cut lengthwise into three or four pieces. The slices are placed in a weak brine (one tablespoon of salt per quart of water) until the fruit is all prepared.

When the fruit is all prepared the slices are removed from the brine, placed in a cheesecloth and are blanched for 8 to 10 minutes in water heated to a temperature of 180° to 192°F. They are cooled in cold water and should be left in the cold water for 5 to 10 minutes. When thoroughly cooled they are packed moderately tight into clean, dry containers and covered with 20 per cent. syrup. The jars are sealed and then processed in the water bath for 12 minutes.

Canned Apple Sauce.—The trade recognizes two types of sauce—strained and rough or uneven. The latter is as a rule better quality and is the one recommended here. If a fine sauce is preferred it may be run through a colander fine sieve before filling.

The apples are peeled, quartered and cored. The prepared fruit is placed in a weak brine until ready to cook. The fruit is removed from the brine and thoroughly rinsed in cold water to remove the excess salt. A syrup is made by dissolving 3 to 4 ounces of prepared fruit in one-fourth cup of water. The fruit is cooked in this syrup in batches up to six or eight pounds,

Cooking proceeds at moderate to slow boiling in a closely covered vessel for 6 to 8 minutes. At the end of this period the cover is removed and cooking is continued at moderate boiling. The fruit is gently stirred a few times to prevent scorching. When there is no free liquid noticeable the sauce is finished. If froth is present the fruit is cooled and stirred until clear. The hot sauce is filled into clean, dry jars, filling them full. The jars are partially sealed and processed in the water bath for 8 to 10 minutes for pint jars. At close of processing the jars are removed, sealed and allowed to cool before storing.

The following data may be of interest to the sauce maker. One pound of prepared fruit will yield approximately one pint of sauce. The following averages of scores of trials are fairly reliable. The waste as peel, core and cut out for the various market grades of apples varies according to sizes within the grade but if a medium size is considered the figures are as follows: A grade 20. B grade 25 per cent., unclassified 30 to 35, culls up to 45 or 50 per cent.

BLUEBERRIES

Blueberries may be canned in syrup, in water, or without anything added to them. This last method gives such a superior grade of canned fruit that only this method is given.

The berries are looked over and all foreign material is removed. The prepared fruit in lots of one or two quarts is placed in a cheesecloth bag and blanched by lowering the bag into the boiling water. The fruit left in the hot water until a few spots of colour on the cloth show it is beginning to lose juice, usually 20 to 30 seconds' blanching. Then it is immediately cooled in cold water, drained and packed, as tightly as possible without crushing, into clean, dry jars. The jars are partially sealed and are processed in the water bath for 12 to 15 minutes for pint jars. After processing the jars are removed, sealed, and cooled before storing.

About three-fourths of a quart of fruit will be required to pack one pint jar. If jars are not filled to the top when cold they were not packed tightly enough or the berries were underblanched.

BLACKBERRIES

Blackberries are at their best only when fully ripened. The fruit is washed, drained, and packed, as tightly as possible without crushing, into clean, dry jars. The jars are filled with hot 30 to 50 per cent. syrup. They are partially sealed and processed in the water bath for 15 minutes for pint jars, 18 minutes for quart jars. After processing jars are removed, sealed and cooled before storing.

CHERRIES

Sour cherries may be canned either with the pits in or pitted. If the pits are not removed the fruits are picked from the stems, washed, drained, and packed as tightly as possible without crushing into clean, dry jars. They are covered with hot 50 per cent. syrup, the jars are partially sealed and processed in the water bath for 15 minutes for pint jars.

Cherries may be pitted fairly by means of the small hand pitters. These machines tend to break up the fruit and if fruit is intended for dessert hand-pitting is preferred. A thin wire loop similar to a hairpin or a wire paper clip may be inserted at the point where the stem was attached and the pit is removed without serious injury to the fruit. A little practice and one may become quite expert with this method of pitting cherriies.

These pitted fruits are packed lightly into clean, dry jars and covered with 50 to 60 per cent. syrup. The jars are partially sealed and processed in the water bath 15 minutes for pints. It requires about three-fourths quart of fresh cherries to pack one pint jar. If more fruit is crowded

into the jar there is not space for enough syrup to sweeten the fruit.

CRANBERRIES

As a rule cranberries are made into sauce before canning. Three types of sauce are common. whole fruit sauce, chopped sauce, and strained sauce. The chopped sauce is generally preferred.

Whole Fruit Sauce.—The berries are washed and then boiled in a covered vessel with one quart of water for each pound or quart of fruit. When the berries are broken up the cover is removed and sugar at the rate of 1 to 1¼ pounds per quart of fruit is added. Rapid boiling is maintained for few minutes until the syrup almost gives the jelly test, or to a temperature of 216-217°F.

Chopped Sauce.—After washing, the berries are run through the food chopper using the medium cutter. Water in the ratio of one quart per pound of fruit is added and the fruit is boiled slowly in a covered kettle for 10 minutes. Sugar at the rate of 1 to 1¼ pounds per pound of fruit is added and boiling is continued in the open kettle until the syrup will almost give the jelly test, or to 216-217°F.

Strained Sauce.—In preparing strained sauce the procedure is the same as in whole fruit sauce up to the point of adding the sugar. The thoroughly cooked fruit is run through a ricer or sieve to remove the skins. The pulps are returned to the fire and sugar in same ratio as given in whole fruit sauce is added. Cooking is continued in the open kettle until the pulps will give the jelly test, or to 216-217°F.

The finished sauce is filled while hot into clean dry jars, filling them full. They are then sealed and allowed to cool before storing.

GRAPES

The canning of grapes to be used for sauce, pie filler, or for subsequent manufacture into juice, jelly or jam may be accomplished in several ways. The most satisfactory method is as follows: The berries are removed from the clusters and washed. They are then packed into containers, using a spoon to press them down until sufficient juice is set free to practically cover the berries. Glass-top jars are partially sealed and processed in the water bath, pints 15 minutes, quarts 20 minutes.

PEACHES

The fruit should be ripe—all soft, or stale fruit should be discarded. The soft ones will make good butter. Stale fruits are seldom if ever used profitably.

The fruits are peeled, halved, and pitted. The halves are placed in a weak brine until ready for packing. The fruit is removed from the brine, rinsed well in cold water and packed "cups" down in clean, dry jars. The syrup should be hot and may vary from 30 to 50 per cent., depending upon acidity of the fruit. The jars are filled with the hot syrup, partially sealed and processed in the water bath 20 minutes for pints, 25 minutes for quarts. Jars are removed, sealed, and allowed to cool before storing.

PEARS

Most varieties of pears are greatly improved if picked when fully grown and are allowed to ripen in storage. The fruit should be uniformly well ripened. Large pears are usually canned in halves, small varieties often are canned whole. If canned in halves, the fruit is peeled, cored, and placed in weak brine (one tablespoonful of salt per quart of water). The prepared fruit is then placed in a cheesecloth a few pounds at a time and blanched in a vessel of boiling water. The length of blanching will vary, depending upon the size of pieces and fruits 3 to 5 minutes. They are cooled at once in cold water and packed; halves, with cups down, as tightly as possible without crushing. The syrup may

be 30 or 50 per cent, depending upon taste. The syrup is added hot, the jars are partially sealed, and are processed in the water bath 25 minutes for pints, 30 minutes for quarts. After processing jars are removed, to cool before storing.

PINEAPPLE

When pineapples are in their full season they are low in price and the home canner may well take advantage of this to can a year's supply of this delicious fruit.

The fruits are first trimmed, that is, the base and top are removed. The fruit is then set on its base on a cutting and with a sharp knife a thin layer of peel is removed by cutting from top to bot om following the curve of the fruit. This slice should remove the outer fibrous coat to about one-half the depth of the eyes. The fruit is then laid on the side and is cut into thin disks, cutting across the core. These disks are trimmed to remove the remaining portion of the "eyes," the core is removed, and the finished slices cut into suitable sized pieces. The pieces are packed moderately tightly into clean glass jars. The jars are filled with 50 per cent. syrup, then partially sealed and processed in the water bath, pints 45 minutes and quarts 55 minutes. After processing, the jars are removed, sealed, and allowed to cool before storing.

PLUMS

As a general rule plums are canned with their skins on. If the bitterish flavour and the astringency of some sorts are objectionable much of these qualities may be removed by skinning the fruits. Also some of the large and purple varieties and one of the Green Gage type are freestone and these may be halved and pitted in the same manner as peaches. The soft, juicy plums such as many of the Japanese and practically all the native varieties for canning.

The fruits should be evenly ripened. If the skins are to be removed it may be dor by blanching just long enough to loose the skins, ½ to 1 minute. If the coloure plums are skinned immediately the fru will be greenish or yellow, dependin upon the natural colour of the flesh. Bı if allowed to stand for several minutes th colour which lies within the inner part c the skin will flow into the flesh, makin the fruit pink or red.

The fruits are packed as tightly a possible into clean, dry jars. The syru should vary from 30 to 50 per cent depending upon acidity of the fruit. Th jars are filled with the hot syrup and al free air is excluded. The jars are thei partially sealed and processed in the wate bath, 20 minutes for pints and 25 minute for quarts. After processing the jars ar removed, sealed, and allowed to coo before storing.

STRAWBERRIES

No fruit loses so much of its natura flavour, taste, and colour as does th strawberry and perhaps in no fruit is th question of variety so important. Strawberries may be roughly grouped into thre classes: (1) Those varieties in which th core or central part of the berry is white (2) those in which the core is pink, an (3) those in which the core is dark red.

Those in group (1) blanch to a pal straw by ordinary methods of canning group (2) holds some of its natural colour but is as a rule very unattractive afte a few months; those in group (3) as a rul retain a fair amount of their colour an are quite attractive and of more than mediocre quality. Srawberries differ greatly in their acidity so that it is difficul to make recommendations regarding th amount of sugar to use or the percentag of syrup best suited to canning.

There are many ways of canning this fruit but only two will be described here The berries first have their hulls or calyxe removed and are then thoroughly washe

to remove all dirt and sand. They should not be allowed to stand long after washing because they soften rapidly if wet.

The berries may be packed into containers as tightly as possible without crushing them and covered with 30 to 50 per cent. syrup. The jars are then partially sealed and are processed in the water bath, pints 12 minutes and quarts 15 minutes.

Strawberries canned in this way will shrink and float in the jar, leaving the lower third to half of jar full of syrup only while the shrunken berries are crowded into the upper portion of the jar. The heavier the syrup the greater the shrinkage of the fruit.

Strawberries may be canned in such manner as to secure a large part of the shrinkage before packing, thereby avoiding in a large measure the floating of the fruit in the jars. The berries are prepared as above. For each quart of fruit 3 to 5 ounces of sugar are allowed, depending upon the acidity. The berries and sugar are placed in alternate layers in a jar or kettle, enough sugar being reserved to cover the top layer thoroughly. The vessel is covered and set aside in a cool place for several hours, overnight if possible. After standing it will be found that the sugar has caused much juice to flow from the fruit and that most of the sugar is in solution in this juice. The fruit is stirred carefully and either gently heated to effect solution of remaining sugar or allowed to stand for a few hours longer. The fruit and syrup are filled into clean, dry jars, filling them full. They are then partially sealed and processed in the water bath, pints for 12 minutes and quarts 16 minutes. After processing the jars are removed, sealed, and allowed to cool before storing.

RASPBERRIES

Of the three commonly grown species of raspberries the red and purple varieties are most commonly canned. The black varieties are very seedy and for this reason are not popular as canned fruit. Cuthbert is the leading red variety. It is large, attractive, of good quality, and stands up well. Latham is a close second. Herbert is a large, juicy berry which breaks up too easily for a good canning fruit. Columbia is the most widely grown purple raspberry and is a popular canning berry.

Raspberries are as a rule canned for use as dessert. They should therefore be sweetened sufficiently for use. The berries should be fresh. They are washed, drained, and packed as tightly as possible without crushing. Syrup will vary from 30 to 50 per cent., depending upon taste. The jars are filled with hot syrup and all free air is excluded. The jars are partially sealed and processed in the water bath, 12 minutes for pints and 15 minutes for quarts. After processing tht jars are removed, sealed, and allowed to cool before strong.

If desired for culinary or manufacturing purposes they may be canned in the same manner as blueberries.

RHUBARB

Rhubarb may be canned in pieces or as a sauce. When young and tender the outer skin should not be removed.

The stalks are trimmed by cutting off the tough part at the base; also extreme outer tip. The stalks are laid on a cutting board and with a sharp knife they are cut into convenient lengths, about ½ inch. The pieces are packed tightly into clean, dry jars. Hot 50 per cent. syrup is added, the jars are partially sealed, and processed in the water bath, 10 minutes for pints and 12 minutes for quarts. After processing the jars are removed, sealed, and allowed to cool before storing.

If the cut rhubarb is allowed to stand in twice its weight of water for 4 to 6 hours it will lose approximately 25 per

cent. of its acid without materially affecting flavour.

Rhubarb Sauce.—The rhubarb prepared as for canning is placed in a saucepan and for each pound of material one-half cup of water is added. It is then cooked at slow boiling until the pieces are soft. One-half pound of sugar per pound of rhubarb is added and boiling is continued until sauce is of desired consistency. The hot sauce is filled into cllean, dry jars, filling them full. The jars are immediately sealed and allowed to cool before storing.

Manufacture of Chamois Leather

The manufacture of "chamois," or oil-leather, is still one of the most important branches of the leather industry.

Chamois leather is now usually manufactured from the flesh splits of "linings" of the sheep skin. Most tanners utilize the entire sheep skin, the grain side being tanned whilst the flesh split is turned into chamois.

Sheep skins are first de-wooled by the fellmonger and eventually collected by the dresser, who sorts them for the most suitable purposes. Those intended for splitting are given a further liming to plump them, and are then split on a machine with a rapidly vibrating knife. Assuming the flesh splits to be dressed as wash or chamois leather, the process is as follows:—

Preparation and Frizing. — After splitting, the linings are again put into lime, the lime-pits being so arranged that the solutions are of a gradually progressive strength. The goods are drawn frequently and the lime strengthened as required. This stage of liming usually lasts from ten to fourteen days, according to the class of skins and their condition. The linings are at the end of this time firm and in good condition for frizing, and all rough flesh and roughness can be easily removed with a sharp knife on the beam. Unskilled labour is often utilized for this purpose, and the operation is also done by machinery; but it is doubtful if much real saving is effected. Skins badly frized are said to require more oil and to want extra work in the grounding operation.

Drenching. — This process is usually carried out in tubs or vats, although in some of the larger works the drum or paddle is used. The tubs used are from half to two-thirds filled with water at a temperature of about 70° to 80°Fahr. To this water is added one to one and a half buckets of scalded bran or meal, the bucket reckoned as holding about three gallons. Previous to drenching, the skins are well washed, either in a drum or paddle, through which an abundant supply of clean water is kept running. This will free them from surplus lime and other objectionable matter, and show a saving in the amount of bran required. The skins are then placed in the drench tubs and are continuously stirred, though it is much quicker to use the paddle for the purpose. This will accomplish the deliming or drenching process in about six hours, against twelve to twenty-four required in the tubs. No definite rule can be laid down as to the amount of drenching required, but an experienced workman will be able to tell when the pocess has been carried far enough by the fell and general appearance of the skins.

When the skins have been drenched, they are well pressed to remove surplus moisture and grease. This is usually done in an hydraulic press, the skins being arranged between plates, sacking, and wood blocks, the whole process taking about an hour

Stocking or Milling in Oil.—When the skins are ready for milling or stocking—each skin is well shaken out to get rid of adhering bran or meal, and they are allowed to cool by being thrown on the floor, care being taken to avoid getting them dirty. They are then stoked for about an hour to get them in uniform condition. Then they are taken from the stocks and a three-gallon pail of cod oil is got ready, also a sprinkler made of leather springs. With this, one operative sprinkles the skins, whilst another gradually throws the skins into the stocks until sufficient oil has been given. They are then milled for three or four hours, when it will be found the skins are covered with soap, and will also have a soapy, slippery feeling when handled. The skins are now drawn from the stocks and taken to the sheds for air-drying, no artificial heat being applied at this stage.

After about a day's steady drying the skins are again stocked and sprinkled with oil as before, the time being usually three hours. They are now drawn and stoved at a temperature of about 100 Fahr., the operation resulting in making the skins a brownish colour. This process of stocking and drying is repeated several times, until the final heating off, when the skins are hooked by the neck on ranges very closely in the drying stove. In this stove the heat is raised to about 150° to 160° Fahr., when a sharp, astringent odour will be given off.

The skins are then thrown, whilst in the heated condition, in bins or casks, well trodden, and covered with sacking to retain the heat. The temperature will at once begin to rise, and the skins will require most careful attention. The millman should go frequently from bin to bin and note the temperature. At intervals they are turned by casting them into another bin, the workman using gloves for the purpose, and the goods well trodden down by a lad. This is repeated until the skins are heated off, a point only indicated by experience.

Care should be taken that there is no surplus oil or moisture on the goods, or damage is very likely to result. The workmen should also wear goggles to protect the eyes, as the vapour arising from the skins is irritating. Sufficient goods should be always available to keep up the process of heating, otherwise parts of the leather will remain green, and will become brown when treated with the alkalies later on. When the goods have assumed a characteristic dark-brown colour they are spread around to cool, and are ready for pressing and washing.

Pressing and Washing. — The skins are then thrown into a vat of water at a temperature of about 110° Fahr., and well pressed in the hydraulic press. Grease will soon begin to exude, and, later on, the substance known as sod oil, all of which being valuable, is carefully collected and treated further if necessary.

When the skins are sufficiently pressed, they are then well washed in an alkaline solution prepared as follows: For ten dozen skins, dissolve 4 lbs. of soda ash and 2 lbs. of soda crystals in sufficient water at a temperature of 120°Fahr. The washing is often done in a paddle, about twenty dozen skins being paddled for about two hours. The goods are now wrung out and the liquor run away. Fresh water is then run in the paddle and the heat raised to 130° or 140°Fahr., and the skins given another hour's washing. In most places some arrangement is made to save the liquor—the first being especially valuable —as this contains emulsified fats which are worth recovering.

Wash-leathers may either be dried after the second washing or given a further liquor to impove their pliability. A practical writer on the subject gives the following method of preparation: Having run off the second liquor, make a third in paddle as follows: in a small mixer or tub put 10 lbs. of cod oil (about 1 gallon)), add 20 lbs. of soft soap; stir the two well together till the mixture becomes stiff, then add one gallon of boiling water until all soap, oil, and water are thoroughly blended. Take of this liquor 3 to 3½ gallons to the paddle of goods, and run for one hour; then draw goods, take to either wringing machine or hydro-extractor.

The skins are now taken to the drying sheds to be dried with air or artificial heat, being hooked by the two hind shanks on tenter-hooks from rail to rail; when dry they are taken to warehouse, and are now called "crust" leather.

For "fleshers," or heavier linings, the process is prolonged, and in washing the amount of materials is increased.

Finishing.—In this condition the goods, as crust chamois, are often sold to dressers and others, who make a speciality of finishing for the market. The skins, after sorting into sizes and qualities, are first staked, either by the arm or upright stake, and are then levelled and worked out by the moon-knife on the perch; this last operation being a skilled operation, and one requiring great care. The skin is extended in every possible way by the workman until it is thoroughly soft, and the fibre can be pulled in any direction.

The goods when finished are then carefully trimmed with shears around the edges, and holes, where possible, sewn up by hand or machine. They are then carefully sorted into qualities and sizes—the sorter stretching each skin as much as possible—and eventually put up into bundles of thirty, known technically as a "kip."

Chamois leather is almost universal in its application, being used by the tailor, the shoemaker for boot linings, the fancy leather goods maker, and for an endless variety of domestic purposes.

Chamois Glove Leather.—The stoutest and best skins are often sorted out in the crust condition, and finished specially for glove leather. They are first well grounded with a moon-knife on the side which is the most suitable for colouring. After this "paring" operation, they are then carefully run on an emery wheel to produce a fine smooth surface, when they are ready for bleaching.

Bleaching.—In order to produce good clear colours on chamois it is necessary to bleach the leather. This is still done by exposure to light, the process taking two or three days in summer and as many weeks in winter. The skins are first well saturated with a warm solution of soapy water, made by dissolving a sufficient quantity of soft soap in it, and are then taken to a suitable grass plot, the side to be bleached and coloured being exposed to the light. This operation is repeated daily until the desired result is obtained, when the goods proceed to the next operation, known as tucking.

Tucking. — The skins are then thoroughly wetted through in warm water, and are then either wrung or run in a hydro-extractor, shook out, and hung on a suitable wooden horse. Each skin is then separately immersed in a vat of boiling soapy water, and when sufficiently tucked, the skins are at once taken to a drying shed heated up to a temperature of 120°Fahr. When thoroughly dry they are taken to the stakers, who work the skins out either on the upright or by the crutch stake, when they are lightly gone over again on the emery wheel. The best size advised for this purpose is a wheel of about two feet nine inches wide by about

nine inches in diameter, which should run at a good speed.

Colouring.—Chamois skins are usually coloured one at a time by spreading them on a convex lead or zinc-covered table. The colour is usually of a mineral base, ochres and umbers being often used. Of late years more or less successful attempts have been made to use coal-tar colours, and in some hands good results are said to have been obtained. The usual mineral colour is mixed to a thick consistency in a sort of paint, and applied evenly with a suitable brush, care being taken to keep the colour well stirred.

The leather is, after colouring, then dried off in a hot stove, cooled off in the air, and again staked. It is then well dusted or "beaten" over a heavy wooden stool to free it from dust, and again run over an emery wheel, care being taken the emery used is fine, so that the final appearance of the leather may be soft and velvety.

The skins are now recoloured and dusted as before described, and in some cases the three operations involved are again carried out.

Dark shades are often obtained on chamois leather by running the skins in a paddle or drum in a weak bark liquor or aniline dye, being subsequently, when dry, topped up or brushed over with a weak solution of aniline colour.

Deep shades of brown are also at times obtained by hanging the skins in closed chambers, and subjecting the leather to the action of ammonia gas, generated by first running chloride of ammonia solution into a suitable vessel in the chamber, and, later, hot lime liquor to liberate the ammonia.

Seamless or Dipped Rubber Articles

In principle the manufacture of seamless or dipped rubber goods is exceedingly simple. A former made of wood, lead, glass, porcelain, or even of ebonite, is dipped into a rubber solution, lifted out and the solution allowed to dry on the outside of the former. This operation is repeated until the layer of rubber left on the former has reached the thickness desired, when the process is completed by the vulcanisation of the rubber and the withdrawal of the completed article from off the former. In practice, however, things are not quite so simple, and it is safe to say that there is no other branch of the rubber industry in which so much care and attention to detail are needed as in the manufacture of seamless rubber goods.

The slightest mistake in the selection of the raw rubber used, in the materials which may be added to the rubber, or in the solvent employed, or the slightest lapse in the attention given during the process can lead to defect in the articles produced which would seem out of all proportion to the contributing causes. Even the weather is a factor to which the successful production of these dipped goods is susceptible.

The raw material, however, is the primary subject to which attention should be directed, it being absolutely essential that a raw rubber which can be freed completely from all particles of sand, bark and other mechanically extraneous matter should be employed. This means that the

choice of the raw rubber is practically limited to the best Para and to the A1 grades of plantation crepe and sheet. The care exercised on the raw rubber does not end with the selection of a suitable grade, but only such portions of a batch of the raw rubber are chosen which appear to be the best and cleanest and from which one might reasonably expect, after very efficient washing, to obtain a product which is quite homogeneous and from which a homogeneous solution can be prepared. For transparent seamless wares the best first latex crepe rubber is usually the only material which enters into serious consideration. Among the organic materials which may be added to the rubber in this branch of the industry are oils, first-class oil substitutes and organic colouring matters and, among the inorganic materials, the pigments, vermilion, golden sulphide of antimony, zinc oxide and carbon black, are the only ones it is customary to employ. Sulphur is also used in some rare cases.

The compounding of the rubber with the other ingredients is effected very carefully, and the greatest precautions are taken to avoid contamination by dust during the mixing process. The finished mixing is run out into thin sheets and used for making up the solution. The solvent almost invariably employed for these solutions is benzine of a definite boiling-point and of a definite density. If the boiling-point be too high, evaporation of the solvent from the dipped goods is slow and the operation becomes too protracted. If, on the other hand, the benzine boils at too low a temperature, evaporation proceeds too rapidly and occasions too rapid a cooling of the surrounding atmosphere with the possibility of the deposition of precipitated atmospheric moisture on the rubber-coated former.

Benzol as a solvent has not met with any degree of favour, but respite the toxicity of its vapours it is used to some extent in the production of coloured goods, especially when the price of benzine is high. Carbon disulphide is too poisonous and too readily inflammable to be used in this connection. For transparent goods neither benzol nor chlorinated ethane can be employed as the solvent, for if they are used the goods produced will be cloudy. The cause of this effect is not known with certainty, but it may depend on some differential solvent action on the hydrocarbon and the non-rubber constituents of the natural rubber or it may be connected with some difference in the optical properties of the solution.

The most suitable concentration of the solution must be determined empirically for each mixing. Solutions which are too dilute are undesirable and uneconomic, whilst solutions which are too concentrated readily lead to defects in the articles produced. As a general rule, however, the solutions employed in the manufacture of dipped goods are more dilute than those used in the spreading and adhesive industries. The actual process of dissolving plant usually consists of a drum mounted horizontally on its long axis about which it rotates, and is preferably fitted internally with baffle plates. Although the power consumption of these drums is greater than that in the case of the ordinary agitated vessel their use is really economical as they produce a much better and more uniform solution. In both cases, however, the finished solution will contain numerous air bubbles and these must be removed by transferring the solutions to large storage tanks when they are allowed to settle until the bubbles rise to the surface of the solution and the air is liberated. The solution to be used in the actual dipping process is very carefully drawn off from the storage tanks and transferred to the dipping department.

An efficient dipping plant consists essentially of a large horizontal sheetmetal cylinder the radius of which varies, with the nature and the size of the articles to be

produced, from 20 to 60 cm. and the length of the side of which is about 2 metres. The cylinder is supported on four high feet and its front wall is provided with a door for the introduction of the frames for the formers or moulds and below this door is fitted a window to permit constant inspection of the interior of the vessel, whilst the operations are proceeding. Within the cylinder, either along its top or at the back wall, are fitted stays to shore it against the collapsing effects of internal reduced pressure, and at the bottom the cylinder is flattened along the whole of its length. The front of the bottom flattened portion of the cylinder consists of double doors which open and close automatically and through which the solution to be used for the dipping is introduced. A shaft which is driven mechanically from the back of the cylinder passes through the axis of the cylinder and when the machine is in operation this shaft is given a slow motion of rotation. Arrangements are also made so that the shaft can be rotated by hand from the front of the cylinder. Along the whole of its length this shaft is fitted with four pairs of keyed holders which hold the frames containing the carriers and formers. These frames are as long as the dipping apparatus and are about 40 cm. wide and are so arranged that the carriers in which the formers are fixed exactly fit inside them. These carriers are of wood of rectangular cross section, 20 mm. thick by 20 to 50 mm. in width in accordance with the size of the formers. The wooden formers are fixed on the carriers. The frames are filled with the carriers in such a way that these latter cannot move, this securing being effected either by screws or by wedges. The dipping vessels are somewhat longer and broader than are the frames and are from 25 to 50 cm. in depth. The vessels are provided with well-fitting covers to prevent the evaporation of the solvent and the consequent drying-up of the solution. Further, to make up for any loss in solvent in excess of the dissolved rubber that is removed from the solution during the working of the dipping process, definite quantities of solvent (which are determined empirically) are added to the dipping vessels from time to time. These dipping vessels, also termed solution chests, are usually moved about on rollers and, since the shaft upon which the frames and the formers are mounted cannot be moved in a vertical direction, arrangements must be made whereby the dipping vessels can be lifted upwards to the shaft so that the formers can dip into the solution.

In the smaller and older plants this elevation of the dipping solution to meet the formers is effected by hand by means of screw spindles, but in all the more recent examples of this type of plant, use is made of a small hydraulic pump actuated by a hydraulic accumulator, an arrangement that has proved quite suitable even in the case of a plant of only moderate dimensions. With this hydraulic plant the usual practice is to have the dipping vessel on a framelike wheeled wagon which can be run on to a platform underneath each of the dipping plants, this platform being the piston that is actuated by the hydraulic pressure and which can be raised when the value regulating the hydraulic pressure is opened.

Suppose now that the dipping operation is to be commenced. The first step is to rotate the central shaft of the plant until a frame carrying the formers which are to be dipped points directly downwards. The cover is removed from the dipping vessel after this latter has been placed on the hydraulic platform, the hydraulic pressure applied and the vessel moved slowly upwards. The double doors through which the dipping vessel has been introduced close automatically as the latter rises in the plant. The vessel is stopped in its upward course when the formers dip into the solution to the desired depth. Then the dipp-

ing vessel is allowed gradually to sink. The more rapidly this sinking or lowering operation is effected the greater the amount of the solution which remains on the formers, but a limit is placed to the speed at which the dipping and lowering processes can be conducted by the necessity of avoiding the formation of air bubbles and consequently defective goods.

The excess solution is allowed to drip off the formers back into the dipping vessel (until the long tenuous fibres in which the gradually thickening solution drops off commence to break as they leave the surface of the former). At this stage in the process the shaft is rotated through an angle of 90 degrees by the hand-operated crank at the front of the machine, so that the dipped formers project outwardly for a short time and so allow the coating of solution to flow to some extent from the point or extremity of the former towards its lower portions. In the meantime the solution vessel has been lowered hydraulically to the base of the plant and the doors closed automatically after this vessel has been taken out. The shaft of the plant is now rotated regularly and slowly by means of the mechanical drive at the back of the machine to which we have already made reference. This regular and slow revolution of the shaft ensures both the uniform distribution of the solution on the formers and the uniform rate of drying of this solution. The drying can be accelerated by the reduction of the pressure in the plant, by warming the air in the plant by a suitable arrangement of steam pipes, or even by the blowing in of warm air. In all these cases the possibility is afforded of the partial recovery of the solvent.

This problem of the recovery of the volatile solvent used in the rubber industry is one that has acquired a great practical importance within recent years, a period which has witnessed a tendency for the price of solvent steadily to rise whilst at the same time the price of the rubber itself has continued to fall. This seems a convenient opportunity to consider this problem, since the branch of the rubber industry devoted to the production of dipped goods is the one which employs the greatest quantity of solvent in relation to the output.

The advisability of the removal, condensation and recovery of the solvents is dictated not only by economic considerations, but also by the equally important hygienic considerations, since the vapours of all the solvents used in the rubber industry are exceedingly deleterious to the health of the workpeople. But it was not until practicable methods for the condensation and recovery of the solvent were elaborated—a matter of quite recent history—that the problem could be grappled with from either of the above two standpoints.

The principles upon which this recovery is carried out to-day are various, but they can be classified into four main groups.

Recovery by Simple Cooling.—The solvent is evaporated by the passage of warm air over it. The air then passes through a cooling chamber characterised by the presence of a system of pipes through which cold water runs. This sudden cooling causes more or less complete deposition of the solvent carried by the air. The efficiency of this type of plant naturally depends upon the temperature difference between the warm entering air and the cooling chamber. The greater this difference the more nearly does the recovery of the solvent approach the quantitative.

Wet Precipitation of the Solvent.—In this process, which is not often used to-day, the air-benzine mixture passes upwards through a tower filled with firebrick or with pieces of ice, whilst water trickles down the tower. The numerous drops of water coming down the tower cool the ascending gas very efficiently and cause the deposition of a mist of steam and benzine vapour which later condenses into

lrops and runs out of the bottom of the towe: along with th: water. A suitable device is then used for the separation of the benzine from the water

The third method combines some of the features of the first and the second, and consists fundamentally in the absorption of the vapours in a liquid solvent, usually a high-boiling mineral oil. The benzine is afterwards recovered from this oil by distillation. The fourth method employs adsorption of the solvent by activated carbon. During the war it was found that it was possible to produce a highly active carbon capable of adsorbing upon its surface an amount of gas—the discovery was first put to account for the adsorption of the poisonous gases used in the war—equal to verv many times the weight of the carbon itself.

Patents have been taken out for the employment of this activated carbon in the recovery of volatile solvents. The air laden with the solvent is conducted through large chambers filled with the carbon and when this latter has become sufficiently saturated with the solvent this latter is recovered by distillation. All the abovementioned recovery methods are in use, and in the especial case of the dipping plants with which we are more particularly concerned in this article two alternatives are possible. The plant can be combined with one of the usual types of recovery installations or it can be constructed with a special recovery apparatus as part and parcel of the dipping plant. In the latter case the whole plant is constructed more solidly and arrangements made that the whole of its air is enclosed, even when the formers are being changed.

In all cases the air in the apparatus must be warmed and removed from the plant either by positive suction or by the maintenance of a sufficient temperature difference between the air in the plant and the air in the cooling chamber. After leaving the cooling chamber, it should be pointed out, the air is warmed up again and returns to the dipping plant so that the volatilised solvent remains in a closed circuit in such a way as to permit of the maximum utilisation of the solvent. But, in any case, the room in which the dipping processes are conducted should be as well ventilated as possible and its air supply should be both warm and dry. This is especially important in wet weather, for when the atmospheric air is saturated with moisture, the rapid cooling occasioned by the evaporation of the solvent from the surface of dipped formers may occasion the lowering of the temperature of the adjacent air to below its dew point, the deposition of moisture on the formers, and consequently to the production of faulty wares.

The various methods adopted for the recovery of the volatile solvent that have been outlined above can, of course, be combined one with another. Thus the main bulk of the solvent can be recovered by the direct cooling method and the remaining traces by means of the oil adsorption or the carbon adsorption methods. This is, of course, not possible when the recovery apparatus is in the form of a closed cycle. In the case of these latter closed cycle methods it is very advisable, in the opinion of the author, to make the air in the apparatus a better conductor for electricity by the addition to it of definite amounts of such gases as ammonia, sulphur dioxide or even of carbon dioxide. By his means the tendency of the benzine to spontaneous inflammation caused by the frictional electricity that may be generated is minimised.

But to return to the manufacturing methods adopted in the production of our dipped rubber goods—we last left them rotating slowly in the dipping plant. After a few minutes of such treatment in the warm air of the plant, the solution will have dried to such a stage that the

formers can be left at rest in any position without any danger of damage to the goods. The dipping of the frames full of carriers and formers attached to other parts of the shaft can now be proceeded with.

When the articles have been dipped to the requisite thickness — and in many cases a single dipping suffices—the whole frame is removed from the machine and is replaced by a new one. It is not good practice to allow the finished goods to remain too long on their formers exposed to the drying influence of the air, for if the drying be pushed to its utmost limit before the articles are removed from the formers the subsequent operations are rendered more difficult. The carriers are, therefore, removed from the frames with as little delay as possible, and the articles on the formers are "rimmed." Almost all dipped goods are provided at the end of the article opposite to the point of the former with a raised edge or rim, the purpose of which is to prevent the too ready tearing of this end of the article. The making of this rim is a delicate hand operation, for the author does not know of any machine that has been practically tried out for the process, although a number of such machines have been proposed. The lower end of the former is taken between the thumb and the forefinger of the right hand and the rubber carefully rolled back until a point usually marked on the former is reached. The greatest skill and delicacy are required in this operation.

Most seamless articles are vulcanised, whilst on the former, with sulphur-chloride solution or with sulphur-chloride vapour and in only a few factories is vulcanisation by immersion in molten sulphur employed. Vulcanisation by the Peachey process would seem to be very well adapted to seamless goods since these latter are very thin in the majority of this point to note that it would be a great advantage in the production of dipped rubber goods if the costly and troublesome organic solvent could be avoided altogether, and if rubber either in the form of its natural or artificial latex could be used so that the only problem would be that of the evaporation of the surplus water.

After vulcanisation, the articles are pulled off the formers and dusted or covered with flour, talc or glycerine to prevent the walls of the articles sticking together, and to prevent the articles sticking one to the other. Articles which are comparatively thick-walled are also vulcanised on their inner surface after they have been taken off their formers, turned inside out, and put back again.

The articles are then washed in alkaline water and cleaned, rubbed up with glycerine (to enhance their polish) and then sorted and packed for delivery. The formers that have been used are cleaned, coated over with glycerine, and re-introduced into their carriers and frames.

In conclusion, a few remarks might be made as to the uses and the types of article in which these seamless dipped wares find their expression. Suckers (teats) are not usually made, from rubber alone, but a considerable amount of oil substitute is introduced along with the rubber. But as it is not desired that the articles should possess an unsightly rough surface, and as the thickness of the articles makes it essential that a number of dips be given, the usual practice in the making of these teats is to use a pure rubber solution for the first and the last dips and to employ the solution containing the factice for the intermediate dips. The transparent teats which have met with such high favour within recent years are made from the best and clearest plantation grade rubbers (first pale plantation crepe) or from very well washed Para rubber. Substitutes are not used in this case.

Before vulcanisation, the teats on the

formers are inspected and any defective ones removed. They are then removed as has been described. If the teats are not too thin the formers in their carriers are fastened in their frames again and given a preliminary vulcanisation in the apparatus for the solution process of cold cure described or, more rarely, in the apparatus for vulcanisation with sulphur-chloride vapour that was described. By this preliminary vulcanisation the goods are made soft enough to allow of their ready withdrawal from the formers without being deformed, but they are not sufficiently vulcanised to permit of their being stretched very much and returning to their original length. At this stage the teats are pulled off the formers and transferred to vulcanising frames or rakes of galvanised sheet-iron. If a frame is being used, when this has been filled (that is when a treat has been put on every peg), a screen plate is secured above the frame, the purpose of the screen being to prevent the teats being thrown off the pegs when the frame is turned upside down. The whole frame is then immersed in the vulcanising fluid to such a depth that all the teats are covered. The teats are vnall washed, cleaned and packed in bulk.

Such articles as surgical investigatory fingers are usually made on glass formers by a single dipping in a solution of pure rubber. Since the skin of rubber is very thin the articles can be vulcanised in the liquid sulphur chloride. After vulcanisation the goods must be well dusted with flour, talc or the like to give them their matte surface.

Decolorising Glass

In modern times the public has come to demand that even the cheapest types of glass should be free from colour. This is not easy to arrange for most of the raw materials used in glass manufacture have some iron oxide present as an impurity, and even a little iron gives a green tint.

It is not only from the batch chemicals that iron finds its way into the glass. While the materials are being mixed they may collect some iron by coming in contact with the moving parts of the mixing machine. Again, during the founding process the chemicals attack the refractory blocks of which the furnace is built and gradually dissolve out parts of them. Finally the cullet or scrap glass returned for remelting may have collected some iron.

We can deal with the problem of the presence of iron in glass in three ways:—

1. As prevention is better than cure we can see that as little iron as possible is allowed to enter the batch. This is the method adopted in the making of optical glass, and to a lesser extent in the production of fine tableware, as in the case of these there are objections to the normal methods of decolorizing.

2. As a half-way house we can, within limits, effect a genuine reduction of undesirable colour by oxidation. This method is seldom sufficient alone, but can be combined usefully with other treatment.

3. Adding complementary colours is the system most freqlently employed when iron is present in any appreciable quantity. *It is with this method that the practice of decolorizing is chiefly concerned.*

PREVENTING THE ENTRY OF IRON

Decolorizers cannot be used in making optical glass for, although the eye might not be sensitive enough to observe the actual colour absorption, the solar rays would be obstructed, and much less light would be transmitted by the glass when used as an optical lens or prism. In producing optical glass, therefore, the greatest care has to be taken in the selection and testing of the materials to be used.

Iron can be kept out of the batch:—

(a) By the choice of chemicals which are specially pure in the natural state.

(b) By the removal of the iron oxide from the ingredients, and

(c) By the virtual elimination of the impurity from the parts of the batch that consist of manufactured products. Even these precautions would not be completely successful by themselves in obtaining colourless metal, for apart from the pale sea-green tint given to glass by the presence of small traces of iron, certain of the silicates have inherent colours. The soda silicate in soda lime glass tends to give a pale bluish-green tint when viewed through any considerable thickness, and the lead silicate has a yellowish hue. The composition of the batch has therefore to be carefully regulated.

CHOOSING PURE NATURAL CHEMICALS

It will be evident that a material like sand, the principal raw product used by the glass manufacturer, is to be found in every degree of purity. For the best types of glass Fontainebleau silver sand has long been popular. The iron content is of the order of 0.02 per cent. The cost of importing this and other sands into India in normal times is naturally higher than that of using home deposits of silica-sand, and can only be justified for particular purposes.

In the same way other chemicals can be deliberately taken from beds where the purest quality is found, even if this involves disregarding local supplies and bringing from distant parts. Chemicals not available in a sufficiently pure state can also be excluded from the batch.

WASHING AND MAGNETIC TREATMENT

The ideal sand for the glass technologist would be one containing only quartz grains, yielding pure silica alone in the founding. Unfortunately all sands contain grains of other minerals, and the higher the proportion of these the more impure is the sand. Further the quartz grains themselves often have a coating of ferruginous clay, which cements the grains together. If the sand is washed this coating is carried away, and there is a marked improvement in the degrees of purity of the sand. Washing is, therefore, a simple and effective way of removing the iron in the case of sand.

The batch materials are sometimes passed over screens, above which are mounted powerful magnets. This magnetic treatment removes much of the metallic iron introduced when raw materials have been crushed or ground in iron mills.

PURE MANUFACTURED MATERIALS

Natural products vary greatly according to the district in which they are mined, and to a lesser extent through local differences in any particular bed. Here the only remedy is to choose a good deposit. But with manufactured products it is clear that more control can be obtained and, for such purposes as glass manufacture, iron and other impurities are kept at a low level. The contrast in this respect between raw and manufactured chemicals will be evident from the details of the iron content that follow. Sands other than those used for glass-making may have over 1 per cent. of iron oxide.

NATURAL MATERIALS

Dolomite	0.15 to 0.20	per cent.
Felsper	0.05 to 0.18	" "
Limespar	0.02 to 0.09	" "
Sand	0.02 to 0.04	" "

MANUFACTURED PRODUCTS

Potash	under 0.01	per cent.
Saltpetre	0.005	" "
Red lead	0.005	" "
Soda ash	0.005	" "

OXIDATION OF IRON

For small amounts of iron reduction of colour is possible by oxidation. The oxidizing converts the iron to the ferric state, and the yellow colour given by the ferric salt is less prominent than the green of the corresponding amount of ferrous silicate.

The chemical action indicated is brought about by the use of nitrates in the batch. If potassium nitrate or sodium nitrate is introduced it yields oxygen on decomposition during the founding process. Not only is there oxidation of the iron present, but there is also destruction of organic matter, so that the colour of the glass is improved in two ways.

Manganese dioxide, otherwise known as powdered black oxide of manganese, which until recent years was much used in connexion with decolourizing because, it gives a colour complementary to green, had a further favourable influence. As in the case of the nitrates the decomposition of the dioxide results in the liberation of oxygen and the consequent converting of :he iron compounds present into the more ıighly oxidized ferric state, with less ıtense colouring effects.

ADDING COMPLEMENTARY COLOURS

There remains for consideration the ıestion of neutralizing the green colour the iron by the deliberate introduction other oxides that provide complementary lours. Colours are said to be complementary when there is equal absor[illegible] the rays of white light. The disad[illegible] of this system is that light rays are s[illegible] ed from the spectrum, and the g[illegible] therefore lose brilliance. If the pr[illegible] is carried too far the glasses become in appearance and grey in colour.

We can now take in turn the chief colourizers, keeping in mind that pur[illegible] (red and blue) is the complementa[illegible] colour for ferrous silicate (which gives yellow-green tint).

MANGANESE

Although not now in general use manganese dioxide is still employed for decolourizing certain glasses. For many purposes it has been superseded by better agents, such as mixtures of the oxides of selenium and cobalt, or some of the oxides of rare earths.

The purple colour from manganese is given to glass only in the presence of oxidizing agents, and in the absence of these the counter-tint is lost, i.e. reducing conditions destroy the colour. For crystal glass manganese can be readily used, for the batch includes potassium nitrate and red lead, both of which liberate oxygen. While undergoing decomposition in the glass melt, the presence of this free oxygen keeps the manganese in a higher state of oxidation, and ensures the purple colouration.

If the founding at a high temperature is continued for too long a time the oxidation cannot last, and when all the free oxygen gas has been evolved any further heating tends to turn the glass green again, by tht conversion of the manganese into the lower state of oxidation in which the purple colour is not evident. The principle here indicated is made use of in an interesting way. If when glasses are placed in the lehr, it appears that decolourizing is just sufficient, the reheating during annealing is apt to

give a final low colour. Hence it has been found better to aim at a slightly pink colour at the time the glasses enter the lehr, so that they may be correctly decolourized after passing through.

In potash glasses manganese gives a bluish-violet colour which is closely complementary to the iron tint. In soda glasses it is not so good, yielding a brownish-violet colour which needs a small amount of cobalt oxide to neutralize the green effectively.

NICKEL

In the same way as just described for manganese the effect of nickel oxide depends upon the type of alkali employed. In glasses where the alkali is composed entirely of sodium compounds a reddish-brown colour is obtained, but in potassium compounds a violet colour results.

For the best table glass nickel oxide and cobalt oxide together have found favour as decolourizers, especially as furnace conditions have no effect on the tint given by these mixed oxides. In Germany nickel is sometimes used with selenium in place of cobalt, but the results are not very good.

RARE EARTHS

Cerium has been used increasingly as a decolourizer in recent years, and has been found to give excellent results. In use cerium is often combined with neodymium.

SELENIUM AND COBALT

These oxides are used together, as the effect of neither is sufficient by itself. The former transmits more of the red rays and the latter more of the blue, so that in combination they are admirable.

The earliest technical literature on selenium pink glasses appeared between 1911 and 1915, and its use was only developed fully after the first world war. The glass manufacturer then found that the pink colour it gave would compensate very accurately for the green iron colour. Selenium gradually ousted manganese, which had previously been the only known decolourizer. Now selenium in combination with cobalt is probably the decolourizer in most frequent use.

Tank furnace practice has helped to bring selenium to the fore. It is extensively used in tanks, as are the salts containing selenium, such as sodium selenite and sodium selenate. It thus contrasts with manganese, which is better used in pot furnaces. Selenium needs reducing conditions, and hence lead glasses cannot be decolourized by selenium and cobalt oxides.

For use with a soda-lime glass the amount of selenium required for decolourizing is of the order of two ounces per ton of sand, with one-tenth its weight of cobalt oxide. The amount has to be varied slightly according to the furnace temperature and the rate of working the metal. The hotter the furnace the more selenium is required, and the more rapidly the glass is worked out the more efficient is the decolourizing. Volatilization occurs very readily, so that selenium shoud not be used with oxidizing agents such as nitre.

iron.

Developments in Cotton Bleaching

Some recent theoretical advances which permitted a deeper understanding of the action of kiering and other proccess in conferring absorbency on the cotton fibre were discussed by Dr. A. E. Stubbs, of the Bleachers' Association Ltd., when he recently addressed the Midlands section of the Society of Dyers and Colourists on the subject of "Developments in Cotton Bleaching at Home and Abroad."

The removal of cotton wax, said Dr. Stubbs, could no longer be regarded as the principal factor determining the conferment of absorbency. In fact, it was possible, without using surface-active agents, to produce highly absorbent material which still remained practically the whole of the cotton wax, whereas, on the other hand, raw cotton which had been dewaxed by prolonged extraction with boiling organic solvents remained substantially non-absorbent. Experiments had shown that absorbency properties appeared in assemblies of cotton fibres when the fibre surface had been subjected to light abrasive treatment, suggesting that the conferment of absorbency might be associated with damage to the primary wall of the fibre. Electron-microscopical work on kiered cotton indicated that extensive damage did in fact occur during the boiling process.

When continuous processing was being contemplated, methods had to be devised whereby absorbency could be attained in a relatively short time, continued Dr. Stubbs. This object could be achieved in various ways. Thus treatments with caustic soda and alkaline hydrogen peroxide might be employed, the rate of attack being accelerated by the use of high concentrations, which were made possible economically by adopting a liquor ratio of 1:1 (pad-steam) in place of the 4:1 or greater ratio used in kiers. This was the basis of American continuous methods. Again the efficiency of the normal kier process could be greatly increased by making certain additions to the liquor and, particularly, by pretreating the cotton with, for example, acids and oxidizing agents, such as Chloramine T or hypochlorites. Such pretreatments appeared to cause attack on the primaray wall of the fibre and greatly to facilitate the subsequent attack by alkali. In consequence, prolonged pressure-boiling could often be effectively replaced by a continuous method of kiering. This was the basis of many of the processes used in the Soviet Union, which made use of continuous "Mathesius" kiers for boiling the pretreated fabric in alkali and for treating it in alkaline hydrogen peroxide when this agent was used for the whitening stage.

Dr. Stubbs then described the American processes in detail, and discussed the qualities of the finished product as compared with those of the products of the older processes The relative merits of hydrogen peroxide, hypochlorite, and chlorite for the whitening stage were considered, and the use of fluorescent brightening agents described, with some discussion of the difficulties which might arise in their use

In discussing the relative merits of continuous and batch methods of processing, Dr. Stubbs said that in large countries, such as the U.S.A. and the U.S.S.R., where single production units handled a comparatively few types of fabric in very large amount, the desirability of adopting continuous were quite obvious. In our small country, however, these methods were not so readily applied because of the large variety of goods which had necessarily to be processed to meet the varying needs of our many markets, and also be-

cause of the predominantly non-vertical, commission basis of the industry.

In times of a recession in trade, such as that recently experienced, the continuous system would show particularly at disadvantages that were normally to be gained from these methods were such that it was difficult to escape the conclusion that the installation of a small number of these ranges in this country would be justified. In fact, until such ranges were installed and the necessary experience of their operation gained, it would be difficult to estimate the extent to which they could be introduced further with advantage. For example, it was possible that some of the lower-quality, dirtier, and "motier" cottons which had to be dealt with here would have to be given special treatment. It was also possible that the future of bleaching in this country would be found to lie more in the exploitation of some semi-continuous modification of the methods of which we had had such long experience. In particular, the days of hypochloric were not necessarily numbered, and the last word had not been said about this old whitening process, which could readily be made continuous and could be combined with suitable continuous or semi-continuous scouring treatments.

However this might be, the practice of bleaching, said Dr. Stubbs, was under going a revolution in many parts of the world, and he suggested that the new, highly productive methods which had been developed constituted a challenge to us in Britain, and that it was for us to consider how that challenge could best be met, taking into account of course, the peculiar features of the British finishing trade.

Possibilities of Exploiting Indigenous Materials in Plastic Industry

Few industries in India have grown so fast in recent years as the plastic industry. The reason for its rapid growth lies in the variety of uses to which plastic materials can be put. The demand for plastics is now based merely on their being substitutes for scarce materials such as metal, wood and fibre, but on their suitability for special industrial purposes. It has also some special characteristics as, for instance, chemical resistance, non-inflammability, lightness in weight, dimensional stability over wide ranges in temperature, good insulation and other electrical properties. This is not all. Plastics can also be moulded into a variety of forms. They can be cast in liquid form, expanded to light sponges, both flexible and rigid; pressed to hard board; extruded to unlimited lengths of rod, tube or profile; calendered to continuous flexible sheet, and moulded to any number of intricated shapes with accurate dimensions. Plastics also bring some economic advantages. They render mass production easier, maintenance costs lower, and handling of materials in certain respects very convenient. All these advantages have been possible on account of extensive application of scientific knowledge to production.

Recognising the importance of science thus to the industry, considerable attention is being devoted in the various research institutes of the country to discover how best the

Indian plastics industry can be developed with the help of indigenous raw materials. An idea of what is being done in this direction is provided in an interesting article on "Plastics—Progress in India", by Mr. S. L. Kapur, National Chemical Laboratory, Poona, contributed to the August issue of the Journal of Scientific and Industrial Research. Those engaged in the manufacture of plastics goods will find in this article material of much practical benefit to them, especially in regard to research.

We are told that research is being carried on, in the Poona Laboratory, the Indian Lac Research Institute. Ranchi, (I.L.R.I.), the Forest Research Institute, Dehra Dun (F.R.I.), Indian Institute of Sugar Technology, Kanpur, and a few others. Organisations connected with the development of the plastics industry in India are the Research Committees on Plastics, Oils Chemicals and Cellulose, Council of Scientific and Industrial Research (C.S.I.R.), Defence and Development wings of the Government of India, the Indian Standards Institution and the All-India Manufacturers' Association in Plastics, Paints and Chemicals.

In recent years, India has also made some progress towards the establishment of plastics industry. There are about 80 organised factories and several cottage-scale establishments, with a capital investment of Rs. 6 crores. The industry provides employment for about 10,000 workers. It depends on imported moulding powders, the consumption of which is estimated at 8,000 tons, comprising 5,000 tons of thermo-plastics and 3,000 tons of thermo-setting. A few firms have started manufacturing general purpose phenolic moulding powders from imported phenol and formaldehyde. The present annual production of moulding powders is about 250 tons. The installed capacity for alkyd resins is about 800 tons a year, but the actual output is only 100 tons. Polystyrene moulding powders of which 2,500 tons are consumed annually, have found favour, by reason of their low price, and are used in the making of accessories for electrical goods, radios, automobiles, toilet requisites and other articles of novelty and utility.

A sound heavy chemicals industry is one of the essential requirements of a modern plastics industry. India does not possess an integrated basic chemicals industry and its petroleum resources are meagre. Development in the field of plastics industry have therefore, been restricted to the utilisation of agricultural products and natural resins. Other raw materials available in the country are benzene, alcohol and cellulose.

The coke ovens in operation in the country are estimated to produce 4.5 million gallons of benzene, but only 2.7 million gallons are actually recovered. Coal-tar distillation has not received sufficient attention and very little phenol is recovered, although about 140 tons of phenol can be recovered annually from 90,000 tons of available coal-tar. The present annual demand by the plastics industry for phenol is of the order of 50 tons.

Ethylene is the key chemical for the preparation of several plastics, such as vinyl chloride, vinyl acetate, vinylidine chloride and styrene. It can be manufactured by the catalytic dehydration of ethyl alcohol. About 400,000 tons of molasses are obtained annually as a by-product of the sugar industry, and this could yield about 280 million gallons of alcohol. Chlorine, another important raw material utilised by the plastics industry, is also freely available, and, at present, about 800 tons of chlorine produced in the country are not being utilized.

Acetyline is employed in the synthesis of basic chemicals required in the manufacture of plastics and elastomers. The starting material for acetylene is calcium carbide which can be manufactured from lime and coal by an electro-thermal process. The development of multi-purpose hydroelectric projects, and the availability of large quantities of superior grades of coal and lime in the country should make the manufacture of calcium carbide economical

Cellulose, the starting material in the manufacture of cellulose plastics, can be obtained

from agricultural and forest produce. The cultivation of cotton rich in linters, compulsory delinting of all grades of cotton and use of low grade cotton waste and cotton dust from textile mills should augment, it is stated, the supplies of cellulose. The manufacture of cellulose acetate at Hyderabad and of cellulose nitrate at the cordite factory at Aravakadu, Nilgiris, is stated to be under consideration.

Other potential sources of plastics and plasticizers are vegetable oils, proteins from oilcakes, animal protein from horns, black liquor, monohydric phenols from wood-tar effluents, and shellac. The establishment of oil refineries now under way would provide, we are told, a ride range or raw materials for the plastics industry in India. Investigations at the Indian Lac Research Institute, Ranchi, have shown that jute-stick flour could be processed and successfully used as a filler in phenolic moulding powders Jute and cotton tuft can be used as filling in shellac moulding compositions.

A few manufacturers in India have been using cashew nut shell liquid in conjunction with phenol in the manufacture of phenol formaldehyde moulding powders. A new application of phenolic constituents of cashew nut liquid and bhilawan shell liquid is in preparation of ion-exchange resins. The possibilities of producing these resins at economic prices are being considered by the National Chemical Laboratory. India produces 14,000 tons of cashew nut shell liquid annually.

The Tata group of industries has been exploring the possibilities of developing moulding compositions from oilcakes and saw-dust. The process consists of an autoclaving mixture of oilcakes and saw-dust at high pressures for general hours. Compositions suitable for the production of articles by compression moulding are obtained.

The Poona Laboratory has undertaken the work of using tobacco seed oil (annual production 5,000 tons) in surface coating compositions. Investigations have shown that kamala seed oil is better than tung oil in formulations of wrinkle finishes on surfaces. The oil has been proceessed into products which give decorative and protective finishes on air drying.

Apart from what is stated above, the article referred to above contains a mass of information regarding the possibilities of developing the indigenous resources for the benefit of the plastics industry. While space considerations preclude us from going through these details, we cannot but resist the temptation to quote here the conclusions of the writer of the article. He remarks: "The full possibilities of using plastics in this country, both in the production of utility articles and in industry, have yet to be explored The demand for both raw material and fabricated plastics, therefore, is bound to grow with the rapid industrialisaion of the country and with the completion of the hydro-electric projects under way. The production of moulding compositions in the country would also lead to the growth of new industries. The exploitation of existing and potential resources for the production of a wide range of articles, therefore, merits the attention of both the Gevernment and the industry"

Synthetic Detergents Industry

Synthetic detergents are synthetically produced chemical substances, with cleansing properties similar to soap. But, unlike soap, these detergents do not produce scum in hard water. They are better at removing grease but relatively ineffective in cleaning soiled fabrics. The well-known powders sold for household purposes are thus a blend of synthetic detergents and certain types of phosphates and other chemicals, which makes them useful for the whole range of domestic washing purposes.

Synthetic detergents industry is yet to develop in India and backward countries This is because the purchasing power of the people in these regions is very low. Washing habits too are quite different from those in the West, in that people generally wash clothes in rivers, tanks, or wells, instead of in tubs or bowls, as in the West. Consequently, soaps or washing powders are in little use and those engaged in the manufacture of synthetic detergents have yet to discover an effective and cheap detergent which is within the meagre means of the masses. Sir Geoffrey Heyworth, Chairman of Unilever Ltd., a concern which carries on a considerable part of the world trade in substitutes for soap, observed, in the course of his review of the position of the synthetic detergents industry that consumption of detergents in underdeveloped countries can be expected to increase as the standard of living improves in them.

The new blended synthetic detergents have achieved a wide acceptance in North America and Europe. The main reason for their popularity is that they do not form insuluble precipitates with the salts responsible for the hardness of water in contrast to soap which forms an insoluble scum tending to adhere to the washing materials and make a lot of rinsing necessary. There is, however, one disadvantage of the blended synthetic products. It is that the detergents are somewhat more expensive to produce than corresponding soap products. In the United States, a packet of a blended synthetic product now costs some 7 per cent. more than a soap product. In certain other countries the differential is little higher. In Canada and some European countries, the detergents are costlier than soaps by about 12 per cent. to 15 per cent.

The chief considertation which seems to have weighed most with these Western countries in developing the synthetic detergent industry is that it tends to lessen the traditional dependence of the soap industry on oils and fats and thus helps to ease the scarcity of oils and fats which prevailed for some years after the war. It is pointed out that, had synthetic detergents never been discovered, the world consumption of soap would have been commensurately greater. Whether this view is correct cannot be proved. But Sir Geoffrey opines that most of the consumption, of blending synthetic detergents has been for purposes for which soap would previously have been used. And, if this demand had had to be met entirely by soap, it would have required an additional world production of oils and fats of about half a million tons. It is possible that the derationing of margarine—which is now complete everywhere except in Britain, Finland, Israel and Austria—might have taken longer and so might the derationing of soap Blended synthetic products have eased, he points out, the post-war problem of meeting the world demand for oils and fats at a more reasonable level of prices.

There is also another reason for the development of the detergents industry in that it has created a demand for important new chemicals. "Up to date, a very large number of different materials", remarks Sir

Geoffrey, "have been evolved, all of which broadly possess the same detergent characteristics, but which differ in chemical composition and in behaviour in use. Some of them are produced from natural vegetable or animal oils and fats. Others are derived from a petroleum base. Thus they are manufactured wherever the chemical and petroleum industries have assumed important dimensions". With their new interest in the production of materials for the manufacture of blended washing products, the chemical industries have become potential competitors to the original soap industry, and soap manufacturers have the opportunity to extend into chemical manufacture. Pioneering work is being done on parallel lines by a number of separate industries. Various chemical manufacturers have discovered a whole series of synthetic detergent substances are engaged in solving the intricate problems connected with producing them at a cost which will make them saleable. The soap industry has applied its knowledge of washing problems to putting the new substances to practical use in preparations of domestic and other washing products that meet the users' needs. If the soap manufacturers loses efficiency, the chemical manufacturer can step into the breach and vice versa. Consequently, the detergents industry has made the soap industry as a whole more dynamic. It has created new and fundamental problems which require re-examination in the methods of their production. This may well lead to greater possibilities of expansion.

In 1952, the various blended powders accounted for as much as 43 per cent. of the sales by weight of all domestic detergents in the U.S as compared with 2 per cent. in Great Britain and 23 per cent. in Holland, excluding toilet soaps. World sales of detergents in that year amounted to one million tons (excluding the Soviet Union). Of this, North America accounted for 800,000 tons and Europe 300,000. This compares with world sales of soap estimated at rather more than 5 million tons. The synthetic products thus constitute a major technological development which has considerable impact upon the world market not only for soap but also for the vegetable oils from which soap is derived

Radioactive Isotopes For Industry

By Martin Chisholm

New radioactive substances, specially "tailor-made" at Harwell for the particular jobs they have to do, are to-day playing an increasingly important part in all kinds of industrial processes. In fact, these radioactive isotopes, to give them their scientific name, are on the way to becoming the "atomic eyes" of industry, and uncannily accurate "eyes" they are! They can "look" into a packet of cereals or detergent on a conveyor belt and "see" if it is properly filled, they can check the thickness of a piece of note-paper even cigarette-paper, and they can "stare" across the white-hot interior of a blast-furnace and "see" whether the molten steel is at its proper level.

These are just three ways, picked almost at random, in which these new substances, made in the large pile of the Atomic Energy Research Establishment at Harwell, are being put into everyday use. One could extend the list almost indefinitely. Even the colours of your new spring curtains, or of the new print frock that your wife is planning to make, may owe some of their freshness and brightness to them.

ELIMINATES STATIC ELECTRICITY

To put it as simply and broadly as possible, these particular isotopes are elements which have been made by atomic processes so that they will give out radiation of the particulr kind and strength that is required for a specific purpose. Some give out Beta rays, which, among other things have the effect of making air conduct electricity. One of their particular uses is in the manufacture of nylon fabrics. The way in which they work can, perhaps, be made clear by a very homely example.

You may have noticed sometimes when you stroke your cat that its fur crackles. You may have noticed that the same sort of thing happens when you comb your own hair. In fact, your hair may even show a tendency to "stand on end." That is due to the presence of static electricity. Now this static electricity can be a source of trouble in the manufacture of fabrics, particularly nylon fabrics; it makes the nylon warps tend to bunch up together or to "balloon", and this leads to difficulties in the weaving. A suitable radioactive isotope, giving off Beta radiation, can get over the difficulty. Placed in the proper position, and suitably shielded from the loom operators, it makes the surrounding air into a conductor which carries away the static electricity, and the nylon warps lie down quietly in the way in which they should lie.

MEASURING THICKNESS

Other types of isotopes give off powerful Gamma radiation which has very strong powers of penetration. It can even get through several inches of steel. These isotopes can be used, for instance, for photographing the inner structure of a heavy machinery part, like the propeller-shaft of a liner, to make certain that there is no dangerous fault in the metal. X-rays can, of course, be used for a great deal of work of this sort, but the development of isotopes makes the job much easier, as no complicated X-ray apparatus is required.

Some radioactive isotopes are particularly useful in the measurement of strip material, whether it be paper or steel strip coming off the rolling mill. The general principle is very simple. A radioactive source of suitable strength is located on one side of the moving

strip. On the opposite side is a detector which picks up and measures the amount of radiation. Some of the radiation is absorbed by the material through which it passes, so what the detector gets is the amount that actually passes through. As this varies with the thickness of the material any change in the thickness of the paper or steel or whatever it is, is picked up by the detector, which gives a signal so that the operators can make any necessary adjustments to the machine

AID TO PACKING

The method of "looking into" filled packages on a conveyor belt works rather similarly In this case a radioactive source is placed on one side of the belt and a detector on the other When a full package, or a package filled up to its proper level goes by, a given quantity of the radiation is absorbed by the detergent or whatever other substance is in the packet But, if the packet is empty, or not filled up to its proper level, more radiation gets through to the detector. In this case the detector can be made automatically to work a device which knocks the faultily filled packet off the conveyor belt

The use of radioactive materials in processes like this does not involve any danger to the user of the paper or steel or soap-flakes or detergents or fabrics There is no question of them becoming in any way contaminated or becoming radioactive themselves. As far as the user is concerned, the radiation simply passes through the product and disappears.

PREVENTS DYE CONTAMINATION

An interesting use of isotopes in the textile industry is for the preservation of pure, bright colours in fabric printing. When a length of fabric for curtains or dress material or the like is being printed in more than one colour there is a danger that small portions of the colour from one of the dye baths on the printing machine will find their way into the baths containing the other colours and thus spoil their purity. It may often be quite impossible to detect this "dye contamination," as it is called, by eye because the dyes do not show their final colours during the printing stage. The fabric has to go through further processes before its true colours are seen.

Specialists concerned with the industrial development of isotopes found a simple solution to this problem. They worked out a method of mixing a known quantity of a suitable radioactive isotope with the dye in one of the baths on the machine. Beside the other dye baths they fixed up a detector to pick up and measure the radiant given off by this isotope. In this way it was possible to find out immediately whether any of the "radioactive dye" from the first bath was finding its way into other colours and the detector would automatically give a warning signal so that the dye could be changed before the colours were spoiled. The isotope used in this process has a very short life, so once again, there is no question of any danger to the user of the fabric

SOLVE VENTILATION PROBLEMS

Isotope experts have recently developed a device for measuring very low wind speeds, speeds far too low to detect by other methods It is so sensitive that it will measure the draught from a cigarette, and, in fact, a really energetic smoker would probably throw it out of gear! This instrument is of special use in helping to solve ventilation problems of all kinds, particularly in the design of ships where proper air circulation is very important to health.

Those are just a few of the ways in which these new radoiactive materials, used in almost microscopic quantities, are helping in industrial processes, and industry is not by any means the only field in which they are being used. Some isotopes are being used in medicine, both for treatment and research, others are finding all kinds of uses in various branches of scientific research work.

Agricultural Tips

MANURE FOR GARDEN FLOWERS

Prepare the bed with 1 maund of well-rotted natural or synthetic farmyard manure, 1 lb. of Sulphate of Potash and 2 lbs. of Superphosphate per 100 sq. feet area. When the seedlings are about 6" high, use Sulphate of Ammonia at the rate of about 1 lb. per 100 sq. ft. of bed. The manure should be mixed with an equal amount of powdered oil cake or earth and applied round the plant at a distance of at least 4" away from it. Apply another dose 2 months later.

PROPAGATING FRUIT TREES

The two artificial methods that are mainly used in propagating fruit trees are as follows: —

BUDDING

The method of budding oranges is very simple. One should get a budding knife which is especially made for the purpose. Budding can be done on one to two-year-old seedlings of sour orange, lemon, lime, pamelo or citron. A T-shaped cut is made with the knife on the stock about 6 inches from the ground. A bud on the axil of a leaf is to be cut off from the bud stick or scion in the form of an eye and is then thrust into the cut. The cut is then tied with jute fibre or waxed cloth. This will make a joint in a week and allow the bud to grow provided operation is done successfully. The time for budding oranges in Assam extends from March to July when the bark slips with the 1st flow of sap in the spring.

GRAFTING

There are various methods of grafting fruit trees of which the clean grafting and whip grafting are stated below: — In the first case the stock is cut about a foot from the surface of the ground and split in two by the blade of the grafting knife in which a wedge-shaped cut scion of a desired tree is put in. The part is then tied up with waxed cloth or jute fibre and then covered with grafting wax. (Grafting wax is made as follows: — Resin 1-1/2 lb Beeswax—4 oz., Linseed oil—4 oz. Resin and beeswax are to be melted together and the linseed oil is to be poured slowly by stirring the material all the time. The wax is then ready for use.) in the second case both the stock and scion are cut across diagonally and a vertical cleft is made in both and the two are joined together by inserting the tongue of one to the cleft of other. Either of these two operations makes a joint and the scion gradually grows up to be a tree. It may be mentioned here that in transplanting budded or grafted nursery stock one should ball it up and trim the top while setting in the garden. In planning seedlings both the top and roots are to be printed.

AGRICULTURAL OPERATIONS FOR MARCH FOR THE PLAINS

Vegetables: —About the middle of this month remove the soil from the stools of Asparagus and cover them over again immediately with fresh soil, well enriched with old manure, and commence watering copiously.

Take up Carrots and Beet and store them in pots of dry earth for future use.

Take up and store onions.

At the beginning of this month, in the upper Provinces. seeds of American Squash should be sown.

The stumps of Cabbages that have been cut should be allowed to remain and be watered, as by their sprouts they will afford nice gathering for the table for some time to come.

Dry the leaves of English Sage and Thyme, and store in bottles.

Make souring of Parsley in a shady place.

Fruits: — Lichees will be ripening; cover the tree betimes with the nets, to save the fruit from birds.

Well water Peach, Plum and Mango trees. Fertilise Vanilla Flowers.

Cut back closely all wood of last year's growth of Bael trees. This is the season, both in Bengal and Upper India for sowing the seeds of fine kinds of Melons

Thin out Plantains, remove the soil from the roots, fill in with fresh cow manure, and water liberally.

Ornamental Plants: — Withhold water from Dahlias and when the stems have died down, take up the tubers and store them in pots of earth or sand in a dry godown

Treat in the same way the several species of Oxalis.

Withhold water from Gloxinia maculate, Lilium longilium and Richardia Ethiopica, and when the stems and leaves have died down, remove the pots, with the bulbs within them undisturbed, to some dry godown, till the time of repotting in the following October. Other bulbous and tuberous-rooted plants of a similar description should, of course, receive similar treatment

Cut well back the wood of last season's growth of shrubs, such as Pionsettia, Holmskioldia, Hamiltonia, Phlogacanthus, Aphelandra, Buddlea, Thunbergia and Cassia alata, that have lately finished flowering

Euphorbia Jacquiniflora should be treated in a similar way, and the cuttings inserted in pots of sand kept in a sheltered place and well watered; they will afford a nice stock of new plants.

Take up the choicer kinds of Verbena to pot, and keep under shelter during the rains.

FOR THE HILLS

Vegetables: — This is a very busy month for the gardener on the hills. The vegetables sown last month should be put out in the open about the middle of this month. Make successive sowings of the same, and first sowing of Peas, Beans, Tomato, Salsify, Mustard, Onion, Cucumber and Knol-khol either in prepared sheltered beds or in pots pans and boxes.

Fruits: — Fruit trees should now be pruned and manured. The treatment for each will be found in its proper place. It may be mentioned in a general way that whatever treatment *fruit trees receive now* will shew itself in the fruit here-after.

Flowers: — About this time the stove and greenhouse should be thoroughly overhauled. Cuttings of Geraniums, Fuchsias, Roses, Hydrangeas, Begonais, etc., should be put down, and a good stock of plants will be the result. Bulbs of Hyacmths, Narcissus, Gladiolus, Tulips, Rainunculus, Anemones, Spiroeas, Ixias, Sparaxis, and the different varieties of Lilium should be put down in pots, or in well-prepared borders.

An occasional application of liquid manure now will have a wonderful effect on Roses. Geraniums and Fuchsias will also be greatly benefitted by an occasional supply.

Seedlings of annuals will be requiring their second shift about the end of this month. Ceneratias, Calceolarias and Heartsease will be sufficiently developed to be moved into their permanent quarters. They should have plenty of light (Sun-Light) and air. The best place for them is under a cloth awnign. They should be liberally watered, and once a week, with a weak solution of liquid manure. These annuals make a grand show if well cared for now.

Ferns should be carefully examined, and those requiring it, should be repotted. Many of the soft-wooded plants, under glass will also require re-potting at this season.

Perennial Phlox, Carnations, Picotees, and Hydrangeas should now be looked to. Give them fresh soil, remove all old and dead branches, and put down cuttings.

The nights and mornings are yet cold, and care should be taken not to allow the temperature in the stove and green house to go down too low.

Scientific Researches and Inventions

ROCKETS WITH ELECTRONIC BRAINS

The most recent rocket news shows that these weapons are now being equipped with electronic "brains" and "senses" which react more swiftly and more surely than anything in nature, capable of instant manoeuvre even at 2,000 miles an hour and of remorselessly tracking and destroying. The crux of these new weapons is the electronic brain which, in some types of rockets, has to do its own thinking. As soon as the weapons are launched they are free agents with senses stronger than the scent of a bloodhound or the eye of an eagle; they search out their objective. Once they have detected it they will dog it to destruction. This deadly faculty depends upon the transistors. These are valves no bigger than a finger-nail. This explains how "a skull" only a few inches in diameter may contain ten times as many valves as the most elaborate television set. They are capable of sending out and receiving signals, reflected back from the faster-than-sound target which is being pursued and of operating the Servo-mechanisms (tiny but powerful motors that work the controls). These transistors are a hark-back to the crystal sets of the earliest days of broadcasting. They are thin flakes of germanium or other crystals, with "cat's whiskers". They are so robust that they are virtually indestructible and will withstand the shock of a rocket take-off or the violence of being fired from a gun—for these "brains" can be fitted to artillery shells.

substance so far used, has been the subject of trials carried out in Iraq and Jordan by a

BETTER HUMIDITY MEASURE

Information has been received that an improved method of measuring the humidity or the air has been developed by the U.S. Weather Bureau. The Bureau uses a new instrument, called the optical hygrometer which has two advantages over past methods of measuring humidity. First, measurement is instantaneous. Second, it's extremely sensitive in temperatures under freezing. The instrument is based on the principle that some wavelengths of infrared light go through water vapour while other infra-red light is absorbed by water vapour. The instrument directs alternating beams of infra-red light at an area of air. One of the beams is not affected by the water vapour in the air; the other is. The difference between the two beams after they have passed through the air is the measurement of the amount of water vapour in the air, according to the report. Only one instrument is now in action, on top of the Bureau's administration building in Washington, but it has already shown that there are great variations over short periods of time in the amount of water vapour in the air.

NEW INSECTICIDE WILL KILL LOCUSTS QUICKER

A new insecticide "Acrodel", which destroys locusts more rapidly than any other Mr. J. H. Stapley, senior entomologist at the Ferhurst Research Station of the British firm of Plant Protection Ltd.

Acrodel is not poisonous to human beings or animals, and its use should greatly facilitate the anti-locust campaign. The trials which were undertaken for the Governments of the two countries were an extension of work done in previous years. The work is also being followed up in East Africa. The insecticide is a liquid applied by a low-volume spayer at the rate of 2 pints in 2

gallons of kerosene per acre against locusts in the hopper stage.

MODIFIED ROSIN OIL VARNISHES

Methods for the preparation of modified rosins have been worked out at the National Chemical Laboratory, Poona. Rosin is a useful constituent of surface coating compositions and is used both as a varnish rosin and as a modifier for phenol-formaldehyde rosins. When rosin is used as such in varnish compositions, the dried film of the varnish gradually crumbles down, because rosin gets easily oxidized in air, forming water soluble compounds. Rosin has, therefore, to be suitably modified before it can be of any use in varnish formulations.

Modified rosins, which are ideal in such formulations, can be prepared by treating rosin with cashew nut shell liquid, or bhilawan nut shell liquid, both of which are plentifully available in India. The properties of oil varnishes, prepared from these modified rosins show that varnishes, prepared from cashew nut shell liquid and modified rosin, are superior to varnishes prepared with other phenolic resins However, the dark colour of the condensate and of the oil varnishes prepared from it is a draw-back in its utilization for light coloured surface-coatings But where colour is not of much importance, it is cheaper to use this product.

UTILIZATION OF SINDRI COAL ASH

About 300 to 400 tons of coal ash are discharged every day from the boilers at the Sindri Fertilizers and Chemicals, Ltd. The disposal of this huge amount of material presents a problem. Investigations were, therefore, initiated at the Central Building Research Institute, Roorkee, to find out a profitable use for this waste product.

As a result of studies conducted at the institute, it has been found that the ash can be used as an aggregate in light-weight concrete in building construction for non-load bearing beams not directly exposed to outside athosphere.

The ash, after being ground, was also tried as a pozzolana in the manufacture of pozzolanic cements. It was found that 10 to 12 per cent of portland cement could be replaced by the ash and the resulting pozzolanic cement could be used in making mortars and concrete.

PRESERVATION OF CASHEW APPLE JUICE

Investigations carried out in the Central Food Technological Researcn Institute. Mysore, have resulted in the discovery of a process by which a palatable and nutritious juice drink can be prepared from cashew apple.

The cashew apple is a by-product of the cashewnut industry in the West Coast districts of India. On a conservative estimate, more than forty lakh maunds of fresh cashew apples go waste every year. The ripe apple is of bright orange colour and yields 50 to 60 per cent of juice, having 12 to 13 per cent sugar. It has not been so far much utilized on account of its characteristic astringent taste.

In the new process, the fruit is steamed under pressure, rinsed and coloured. The juice is then extracted, strained through a clean coarse muslin and treated with gelatine. After straining a second time, this juice is ready for the addition of preservative and for bottling

KATHA AS PRESERVATIVE FOR VEGETABLE OILS

Aca-catechin, a crystalline product obtained from the ethyl acetate extract of Katha, has been found to be highly efficient in preventing vegetable oils turning rancid. Katha, a mixture of several catechins, is obtained from the heart-wood of Acacia catechu, which grows in abundance in India, and its production is a flourishing industry.

Engineering Notes

NEW MORRIS COMMERCIAL VAN

A new 20-cwt forward-control van, incorporating fush sliding doors, large-section low-pressure tyres and 2.2-litre o.h.v. engine, has just been announced by Morris Commercial Cars Ltd. Outstanding featu[illegible] of the van, it is claimed, are economy, speed and manoeuvrability.

The specially designed [illegible] and low-built floor give the van body a capacity of 235 cu. ft., and the slightly curved rear doors, *hung on outrigger hinges, can be folded back* and secured against the body sides for delivery work and loading in confined spaces. The flush-fitting sliding doors of the cab have similar advantages and are much safer than the opening-out type. Production will start almost immediately, and the new model will be available on both and export markets as a complete van, or in chassis form.

CLYDESIDE PLANS GIANT DRY-DOCK

Giant dry-dock, 1,200 ft. long and capable of accommodating the world's biggest merchant ships and warships, will be built at the Greenock, Scotland, if plans submitted by the Greenock Harbour Trust to the British Admiralty are agreed to. The dry-dock will be 160ft broad and have water depth of 47ft. Cost is estimated by the Trust at between £3 and £3½ million. Erection would take about three years.

Six years ago the Admiralty carried out a number of experimental borings in the area of the East India and Victoria harbours, where the new dock would be erected. These revealed an average of 50 ft. of clay over the underlying foundation of sandstone. This would reduce expenditure on excavations considerably. During the last quarter-century, with the increase in the size of ships, all the larger passenger vessels built on the Clyde have had to be sent to Liverpool for dry-docking. Today, even oil tankers have outgrown existing facilities. The plans include provision for a fitting-out basin for ships, complete with rail and crane facilities.

LOW-COST GRADING WITH NEW LIGHT EARTH-MOVER

A light maintenance grader which, it is claimed, will handle many of the smaller jobs on which larger earth-moving machines have, until now, had to be uneconomically employed has been introduced by a British firm. The new machine, with a working weight of 8,000 lb. and a big 42-b.h.p. motor, is capable of moving large amounts of earth and—because of its sensitive hydraulic controls, which give quick, easy response to fingertip touch—of grading to fine limits.

To withstand the shock inherent in grader usage, the machine is very robustly constructed. With the fact that many of the graders will have to work in remote parts of the world—often in the hands of unskilled drivers—in mind, operation and maintenance have been made exceptionally simple. The operator, comfortably seated, has all the controls within easy reach and the work in progress always in view; loss of efficiency due to operator fatigue is thus cut to a minimum.

BRITISH ELECTRONIC "BRAIN" FOR OIL RESEARCH

British electronic "brain" has been ordered for research work overseas. Delivery will be made early in 1954 by a British firm to the Royal Dutch/Shell group of an electronic digital computer for use in the group's large research establishment in Amsterdam, Netherlands. The machine will be housed in a new laboratory now being built. Including instal-

lation and ancillary equipment, the value of the order is approximately £100,000.

A development of those installed in the universities of Manchester and Toronto, it will be the first electronic digital computer that the firm has been called upon to make for purposes other than academic or governmental use, and the first large machine it is supplying to a commercial undertaking. This apparatus—Number 6 of a series designated the "Manchester Universal Electronic Digital Computer"—will be used for the extensive calculations required in research in petroleum chemistry and engineering.

A NEW FIBRE

Imperial Chemical Industries (ICI) is to build a plant in Canada for the manufacture of a new synthetic polyester fibre named ,'Terylene". A product of British research, this fibre was discovered in the laboratories of the Calico Printers Association Ltd. Clothes made from it are claimed to be extremely strong and long-wearing, to wash easily, dry rapidly and need little ironing. In its staple form "Terylene" fibre makes possible the production of socks, knitwear and suitings which are washable, quick-drying and almost uncreasable.

Expenditure on the project will be more than 20,000,000 Canadian dollars, which will be found in Canada in accordance with proposals approved by the Bank of England. The plant is intended to supply the full demands of Canadian market. The proposed site is at Millhaven, near Kingston, Ontario ICI has acquired world rights, apart from the U.S.A., where the fibre is being manufactured and sold under the name of "Dacron". ICI has invested considerable sums in research on and development of the fibre, and production in the United Kingdom on a pilot-plant scale started some years ago Construction in Britain of a full-scale plant is well advanced.

Products will be identified, and the whole exhibition will be manned by staff from every country represented.

MOISTURE MEASURING EQUIPMENT

Moisture measuring equipment which is accurate to within a quarter per cent and takes only a few seconds to operate has been invented by a British firm.

This is an electronic instrument for testing the condition of wool yarn and is claimed to be an entirely new testing method. based on changes in the dielectric constant of the yarn. The apparatus is designed to test closely-packed spools of yarn, where moisture content be unevenly distributed along the length and might be well away from the surface of the package A "magic eye" tuning indicator used in conjunction with a moving dial gives ila precise result.

TINY WRIST RADIO PERFECTED

A wrist radio has been developed at the Signal Corps Engineering Laboratories, at Fort Monmouth, New Jersey. It is about the size of a wrist watch, and is carried strapped to the owner's wrist.

The little radio uses five transistors instead of ordinary vacuum tubes, and can pick up radio broadcasts sent from stations 40 miles away.

Powered by a mercury battery a little larger than the top of a pencil, the radio has a short antenna which is concealed in the wearer's sleeve. The incoming sound is carried to the wearer's ears through wires that connect to a hearing-aid earpiece.

Although the tiny radio does not transmit messages, it can receive programmes on a tuning range of 1,000 to 1,500 kilocycles. This is about one-half of the standard broadcast band. The radio is housed in a transparent plastic case two inches long, one and one-eight inches wide, and three-fourths of an inch thick.

Official India

CHEMICALS OF INDIA FOR RESEARCH WORKS

The Council of Scientific and Industrial Research, on the recommendation of the Chemical Research Committee, has started a scheme for the preparation of research chemicals in the National Chemical Laboratory, Poona, for assisting research workers to secure chemicals at a reasonable cost.

Research workers in India have been dependent so far on imported chemicals. This has meant inordinate delays, exorbitant cost and prolonged correspondence.

Under the new scheme, the National Chemical Laboratory has got into touch with various laboratories and nine of them have undertaken to supply different chemicals. The fair price of the chemicals is fixed according to a schedule prepared by the Chemical Research Committee. The National Chemical Laboratory will, where necessary, carry out quality tests on samples of the products.

REDUCTION IN PRICES OF PETROLEUM PRODUCTS

According to the Note, issued by the Government of India in the Ministry of Works, Housing and Supplies the price of some petroleum products have been reduced with effect from December 2, 1953. The reductions have mainly been made possible by the greater availability of these products from nearer sources and the fall in freight rates.

The reduction vary according to the different areas of supply. They are as follows: —

Kerosine.—From 6 annas 6 pies to 9 annas per unit of eight gallons.

Motor Spirit.—6 pies per gallon in areas supplied from Visakhapatnam and Calcutta.

Vaporising Oil.—3 pies per gallon.

High Speed Diesel Oil.—From 1 anna to 1 anna 3 pies per gallon.

Light Diesel Oil.—From Rs. 3 to Rs. 4/7/- per ton.

Furnace Oil.—From Rs. 3/11/- to Rs. 6/2/- per ton.

It is now nearly two and a half years since supplies of petroleum products from Abadan have ceased and the Oil Companies have had to make special arrangements to bring in supplies from other sources at greater distances. These arrangements have so far made it possible to maintain adequate stocks of petroleum products in the country and meet the country's demand in full.

The arrangements involved the Companies in increased expenditure on freight charges, to recoupe which they have been allowed to raise the prices of petroleum products sold in the country. In order to ensure however that the rise in prices is no more than what is actually necessary to meet this additional cost, the Oil Companies are maintaining, by arrangement with Government a special account of this purpose.

SUPPLIES OF FERTILISERS

As complaints are received, from time to time, of a shortage of fertilisers in different parts of the country, the Government of India would like to make it clear that the State Governments have sufficient stocks in a number of their Depots and the Government of India have also stocks at Bombay, and Sindri which are sufficient to meet all demands from the States. If, therefore, there is any difficulties in getting of Sulphate of Ammonia, the consuming public are advised to bring this to the notice of the State Government concerned and also inform the Ministry of Food and Agriculture, Government of India.

To achieve increased production of food and other crops, the Government of India

have for some time past emphasised the need for maximum use of fertilisers. To this end, they have been taken steps to make supplies of fertilisers available throughout the country, reduced the pool price and given credit facilities to the State Governments to enable them to supply fertilisers on credit to cultivators.

STANDARD FOR SILICA REFRACTORIES

An Indian standard for silica refractories for general purposes has been issued by the Indian Standards Institution It is one of a series of Indian standards for refractory materials and covers the requirements of silica refractories for general purposes, such as in the steel and glass industries for coke ovens.

This standard prescribes the technical requirements for silica bricks and shapes and the methods for evaluating these have been included in a separate Indian Standard covering the methods of sampling and testing of refractory materials

The standard has been prepared by Indian Standard Institution's Refractories Sectional Committee which includes nominees of various manufacturing interests as also representatives of Central Glass and Ceramic Research Institute, Ministry of Railways, Indian Bureau of Mines, National Metallurgical Laboratory, Directorate General of Ordnance Factories, Directorate General of Supplies and Disposals and Naval Headquarters.

SHOW-ROOM FOR INDIAN EXHIBITS IN COLOMBO

The Commercial Secretary to the High Commissioner for India in Ceylon is organising a Show-Room for Indian products in a prominent business locality in Colombo. Arrangements are being made for exhibiting various Indian products from time to time in this show room. The first exhibition will be of textiles, textile goods, carpets and handicrafts. The exhibition is scheduled to open on the 26th January 1954 and will run for about 3 months.

The commodities chosen for exhibition and the duration of exhibition of various commodities will be notified from time to time.

Indian manufacturers and exports desirous of promoting sales of their goods in Ceylon are advised to avail themselves of the opportunity offered by the show-room. It is important that only high quality goods are sent to the exhibition and they arrive in time. Terms and conditions for sending exhibits can be had from the Director of Exhibitions, Ministry of Commerce and Industry, Exhibitions Branch, "B" Barracks, Queensway, New Delhi.

DEVELOPMENT OF HANDLOOM INDUSTRY

During the last three months, the Government of India have approved several handloom development schemes submitted by State Governments, costing approximately Rs. 215 lakhs out of the four crores earmarked for the development of the handloom industry in the country during the financial year 1953-54. This amount of Rs. 215 lakhs has already been placed at the disposal of the State Governments. They have under consideration further schemes involving an expenditure of about Rs. 45 lakhs and sanction for the same may be expected shortly.

The amounts so far sanctioned for the implementation of handloom development schemes will be spent mainly on rebates on sales of handloom cloth from co-operative stores and Government emporia and on the organisation of the handloom weavers on sound lines by advancing as loan the working and share capitals of weavers' co-operative societies. Altogether 67 schemes of seven other State Governments are under consideration. It is expected thet before the end of this month the remaining States also will send up their schemes.

WOOLLEN INDUSTRY IN INDIA

A vigorous plea for the establishment of an expert committee to enquire into the problems of the Indian woollen industry and to suggest ways and means of placing it on a sound footing was put forward by Mr. Sobhan Lal, President of the Federation ot Woollen Manufacturers in India, in the course of his address at the annual general meeting of the Association held in Bombay. The terms of reference to the Committee, Mr. Sohan Lal said, should include the following:—

1. To study and suggest a stable import policy for raw materials and manufactured woollen goods;

2. To recommend an export policy for indigenous raw materials and manufactured goods, with particular reference to South, Near and Middle-East Asian markets; and

3. To examine labour rules and regulations, with a view to suggesting a policy best suited ot the conditions of the wollen indusary.

Proceeding, Mr. Sohan Lal urged the Government to ban imports of civilian goods of cheap variety. With regard to raw wool exports, he suggested that such should be permitted only after the demand of the indigenous industry had been fully met. He emphasised, in this connection, the need for the Government undertaking a fresh sheep-census in the country. There is considerable force in this last plea of Mr. Sohan Lal, in the absence of an up-to-date census, the correct estimate of the production of indigenous wool has been rendered difficult. Different interests give different estimates. If, therefore, the Government is to follow a rational export policy for raw wool, it will be very necessary to base the policy on a correct estimate of the domestic supplies of and demand for raw wool.

Mr. Sohan Lal stressed also the need for uniformity in the levy, collection and administration of sales tax in the different States. Referring to the quality of woollen goods manufactured in India, he revealed that the Committee had been making efforts to collect from countries, such as the U.S.A., the U.K. and Australia, necessary date relating to conditioning houses for undertaking essential tests and drawing up of standards for products.

BETTER PROSPECTS FOR INDIAN TEA

Mr. K. R. Bhansali, Chairman of the Calcutta Tea Merchants' Association, at the annual general meeting of the Association, held in Calcutta expressed the tea traders' satisfaction at the return of order and stability to the tea markets of the world and drew attention to the tasks ahead of the tea industry and trade.

Welcoming the revival in prices since the beginning of the current year, Mr. Bhansali said that, at the present level of prices, the majority of producers should be able not only to make both ends meet but to earn some profits, although not sufficient to cover all the losses that were suffered in the last recession. The initial spurt in prices noted in the earlier months of the current has not doubt spent out, but the present level of prices was, in the opinion of Mr. Bhansali, appropriate and one at which the trade could function. So far as tea traders are concerned, it is not the actual level of prices that is of much consequence, but stability of prices which a well regulated commodity market as tea should normally ensure. "This price," Mr. Bhansali desired, "should be such as renders production regular and remunerative and facilitates off-take by different consuming countries."

Just as the disturbance in the relationship between the demand and supply, apart from other reasons, caused the crisis last year, the balancing of the supply to the demand during the current season is expected to bring about a welcome measure of firmness for tea prices.

It is not suggested that there will be a complete and violent reversal of the downward trend witnessed last year, for no serious shortage of tea is expected. The supply and demand position however, is such that a fair measure of stability in prices at somewhat higher levels than last year can be reasonably anticipated.

The world production of tea during the current year is not expected to exceed that of last year. On the demand side, stocks in the U.K. are, at present, at the lowest level for some time past and packet trade, it is stated, expects to have an orderly replenishment from India. The overall exports from India during the last season were nearly at the previous season's level. Actually, India gained some ground in Australia and Egypt. It is expected that India will be able to enlarge its exports to these countries. The trade deal with Egypt, for instance, may facilitate better off-take from that country, if energetically followed up by the trade. The built-up stocks in the U.S., Canada and Eire are likely to run out. Some of the Continental countries, such as West Germany have reduced tea import duties, and, with the increased efforts made from London, it would be possible to sell more on the Continent. Enumerating these favourable factors, Mr. Bhansali pointed out that there was not much fear that demand for Indian tea might not be sustained.

The crisis of last year has served producers and traders to draw many important lessons for the future. So far as traders are concerned, it has brought to light the need for developing the marketing facilities available at Calcutta for disposal of tea. In other words, the desirability of building up the Calcutta market as a world centre of tea trade gained strength. According to Mr. Bhansali, the off-take capacity of the London market in its conditions, particularly after the auctions were resumed last year, had not been assessed and that was the reason why large quantities of tea went to London in the past and depressed prices for long. Calcutta and Colombo often paid the producers higher prices than London. In the light of this experience and the delay that normally takes place in realising payments against shipments made to London auctions, tea traders have found the necessity for developing the Calcutta market as early as possible.

Mr. Bhansali drew pointed attention to the difficulties created by the recent amendments to the excise duty. His main concern was the the procedural difficulties of the amendments. Another source of concern to the tea trade, Mr. Bhansali said, was the notice served by the sales tax authorities of Saurashtra to assess the members of the Association to the payment of sales tax under the Saurashtra Sales Act. This new measure, he felt, was a levy on commission agents and would become a multi-point levy, given the character of a further excise levy. It would, as a consequence, prove to be an impediment to inter-State trade.

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Company Reports

NILLAMPATHY TEA AND PRODUCE CO., LTD.

The directors of the above Company (Managing Agents: Messrs. A. V. Thomas & Co. Ltd., Alleppey) submit the audited accounts of the Company for the year ended 30th June, 1953.

The tea crop harvested is less than the estimate for the year by 20,836 lbs. owing to unfavourable weather conditions, the rainfall during the year being only 88.94" as compared to 110.67" for the previous year. The cost of production was higher than the estimate, mainly on account of higher wages to labour consequent on the implementation of the Minimum Wages Act.

The rubber crop harvested this season was a record one being 13,700 lbs. more than the estimate (62,500 lbs.), the average yield per acre amounting to 610 lbs. This extremely satisfactory result was achieved by the systematic improved methods of tapping and cultivation adopted on the Company's rubber property. Notwithstanding the high yield secured, the cost of production, though lower than the estimate for the year, was higher than that of the previous year due to higher wages paid to workers.

The coffee crop harvested during the year amounted to 57.37 cwts., against an estimate of 20 cwts. and the cost of production was Rs. 1,057.09 per cwt.

The cardamom crop harvested during the year was 15,990 lbs. very satisfcatory having exceeded the estimate by 9,990 lbs. and naturally the Estate cost of production was lower than that estimated.

The tea seed obtained was 30 maunds as estimated, though the cost of production was slightly higher than the estimate.

The net profit for the season, after providing for depreciation and income-tax, amounts to Rs. 1,47,372 (Rs. 1,78,923) to which has to be added the amount of Rs. 49,322 (Rs. 52,399) carried forward from last year making a total of Rs. 1,96,694 (Rs. 2,31,322). From this a sum of Rs. 27,000 has to be deducted towards 6 (6) per cent. dividend paid to preference shareholders for the year and also a sum of Rs. 7,500 towards reserve for bad and doubtful debts leaving a balance of Rs. 1,62,194 (Rs. 2,04,322) available for distribution, which the directors recommend be disposed as under:

Payment of a dividend of 12-1/2 (12-1/2) per cent. for the year 1952-53 on ordinary shares Rs. 1,50,000 (Rs. 1,50,000) and carry over to next year Rs. 12,194 (Rs. 49,322).

BENGAL JUTE MILL CO., LTD.

The directors of the above Company (Managing Agents: Messrs. Soorajmull Nagarmull, Calcutta) submitted the audited accounts of the Company for the year ended 30th June, 1952.

The accounts showed a gross profit of Rs. 10,33,746 (Rs. 96,77,796). After providing Rs. 2,19,380 (Rs. 3,40,176), for depreciation and Rs. 2,56,297 (Rs. 13,05,898) for interest, commission, allowance and other expenses, there was an available balance at credit in profit and loss account of Rs. 5,58,069 (Rs. 80,27,722). To this sum was added the amount brought forward from the previous year of Rs. 4,07,701 (Rs. 1,09,979) making a total of Rs. 9,65,770 (Rs. 81,37,701). The directors set aside as a reserve for taxation (income, super-tax, etc.) a sum of Rs. 2,57,000) Rs. 40,00,000) leaving a balance of Rs. 7,08,770 (Rs. 41,37,701), out of the above sum the directors paid a dividend of 5-1/2 per cent. per annum on 10,000 redeemable cumulative preference shares for the year ended 30th June, 1952, (free of income tax) Rs. 55,000 (Rs. 55,000) and a dividend on 2,25,000 ordinary shares of Re. 1 (Rs. 3) per share (free of income-tax) for the year ended

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30th June, 1952. Rs. 2,25,000 (Rs. 6,75,000), leaving to be carried forward Rs. 4,28,770 (Rs. 4,07,701) after transferring Rs. 30,00,000 to reserve account.

MIDNAPORE ZEMINDARY CO., LTD.

The directors of the above Company (Managing Agents: Messrs. Andrew Yule & Co., Ltd., Calcutta) submit the audited accounts of the Company for the year ended 13th April, 1953.

The accounts show clearly the effects of the contraction of income resulting from the loss of the Company's East Pakistan and Bihar Concerns. Total collections including *selami* were Rs. 11,45,525 (Rs. 8,18,989) lower than last year and, by the exercise of strict economy, expenses have been proportionately reduced The amount at the credit of profit and loss account before providing for taxation is Rs. 6,30,151 (Rs. 8,18,989).

As mentioned in the last report, the Company *no longer* holds any rent-receiving interests in East Pakistan or Bihar. No compensation has yet been received from either Government for the property taken over from the Company.

A bill for the abolition of *zamindari* in West Bengal is now before the Assembly.

After providing Rs 4,50,000 (Rs. 6,80,000) for taxation and Rs 43,810 (Rs. 43,810) for the preference dividend there remains at the credit of profit including Rs. 4,609 (Rs. 93,984) carried forward from last year) from which the directors recommend a dividend of Rs. 1-8 (Rs. 2) per share absorbing Rs. 1,41,000 (Rs 1,88,000) leaving Rs. 4,031 (Rs. 4,609) to carry forward.

GREAT EASTERN SHIPPING CO., LTD.

The directors of the above Company (Managing Agents: Messrs. A. H. Bhiwandiwala & Co.. (Bombay) Ltd., (Bombay) submit the audited accounts of the Company for the year ended 30th June, 1953.

The Company has maintained its progress. During the year under report the total freight earnings in respect of owned and chartered vessels amounted to Rs. 1,70,28,297 as compared with Rs. 93,44,707 for the previous year After meeting the unusually heavy general survey repair charges amounting to approximately Rs. 9,00,000 in the case of s.s. "*Jag Vijay*" the Company has earned a gross profit of Rs. 25,05,944 (Rs. 25,14,327). After deducting the normal depreciation of Rs 8,75,716 (Rs. 4,72, 528) initial depreciation of Rs. 2,16,723 (Rs. 10,72,223) and the managing agents' commission of Rs 1,42,159 (Rs 99,429), there is a net profit of Rs. 12,71,346 (Rs. 8,70,347). Adding Rs. 54,532 (Rs. 44,184) brought forward from the previous year, the amount available for appropriation aggregates to Rs. 13,25,877 (Rs. 9,14,531). The directors recommend the following appropriations:—

Dividend at 10 (10)per cent. on the 3 (2) lakhs fully paid-up ordinary shares of Rs. 10 each Rs. 3,00,000 (Rs. 2,00,000), dividend at 10 (*nil*)per cent. for 6 months on 2 lakhs partly paid-up shares of Rs. 10 each (Rs. 5 paid-up) Rs. 50,000 (*nil*), reserve to meet taxation liability Rs. 6,00,000 (Rs. 2,60,000) and to reserve fund Rs. 3,00,000 (Rs 4,00,000), leaving to be carried forward to next year Rs. 75,877 (Rs. 54,531).

The partly paid-up shares participate in the profits of the Company from 1st January, 1953, and therefore dividend provision as recommended above has been made in their case.

The four-yearly general survey of s.s. "*Jag Vijay*" was due during the year under report. In view of the survey requirements heavy repairs were carried out at a German repair yard. The vessel is now in a very good condition.

Pharmaceutical Recipes

ADHESIVE PLASTER

Rosin	10	grams.
Lead plaster	85	„
Hard soap	5	„

Melt the rosin, lead plaster and hard soap separately, at a low temperature, and mix them.

Lead oxide	40	grams.
Olive oil	80	„
Distilled water	40	or q.s.

Boil gently together in a steam bath, stirring constantly until combination has been effected, when cool remove the plaster-like mass produced; knead it thoroughly with hot water and allow it to dry.

ANTI-RHEUMATIC LINIMENT

Capsicum	1	oz.
Oil of turpentine	1	pint.
Menthol	1	oz.
Oil of origanum	2	dr.
Oil of Gultheria	1	oz.
Oil of camphor essence	1	pint.

Macerate the capsicum with the turpentine oil and then add the other ingredients one by one.

CAMPHOR WATER

Camphor	1	gram.
Alcohol (90 p.c.)	2	c.c.
Distilled water	1000	„

Dissolve the camphor in the alcohol, add this in portions to the water, agitating after each addition; finally shake at intervals until all is dissolved.

ARTIFICIAL CARLSBAD SALT

Sodium sulphate	550	grams.
Potassium sulphate	10	„
Sodium chloride	100	„
Sodium carbonate	350	„
Distilled water	550	„

Dissolve the potassium sulphate and sodium chloride in the water, and add the solution to the sodium carbonate and sodium sulphate, previously melted in a dish; evaporate until the weight of the product is 1000 grams and set aside to cool, stirring frequently so as to avoid the formation of large crystals. Distribute any remaining mother liquor uniformly over the crystals, and dry by exposure to the air.

Dose :—2 to 6 grams.

CAMPHORATED SULPHUR OINTMENT

Sublimed sulphur	1	oz.
Carbolic acid	1½	„
Resorcin	1½	oz.
Camphor	1½	„
Solution of coal tar	2½	„
Lard	21	„
Soft paraffin	21	„

Melt the lard and soft paraffin and then incorporate other ingredients after removing from the source of heat.

CATARRH INHALANT

Menthol	320	gr.
Pine oil	160	mins.
Lavender oil	80	„
Cinnamon oil	30	„
Origanum oil	144	„
Eucalyptus oil	120	„
Liquid formaldehyde	40	„
Rectified spirit	8	oz.

Mix.

COMPOUND TINCTURE OF CHIRATA (I.P.L.)

Chirata, cut small and bruised	100	grms.
Dried sweet-orange peel, bruised	37.5	„
Cardamom, bruised	12.5	„
Alcohol (45 p.c.)	1000	c.c.

Macerate the chirata and other ingredients with 500 c.c. of the alcohol for seven days. Then strain and dilute with remaining portion of alcohol.

DANDRUFF CURE

Olive oil	2	ounces.
Bicarbonate of potash	2	drams.
Solution of ammonia	2	„
Tincture cantharidine	2	„

Mix thoroughly. Rub in the scalp and the hair roots. Wash with cold water. Apply a little hair oil afterwards.

DYSENTERY CURE

Castor oil	1	oz.
Gum acacia	3	dr.
Sugar	3	„
Carraway water	4	oz.

Add 1 ounce of the water to the gum. Then add oil gradually and stir. Then add water to make 4 oz.

Adult dose :—15 drops to 1 dram.

ECZEMA OINTMENT

Lanolin	200	oz.
Petrolatum	200	„
Beeswax	50	„
Phenol	5	„
Camphor	10	„
Oil of eucalyptus	50	„
Salicylic acid	10	„
Perfume to suit		q.s.

Recipes for Small Manufacturers

SILVERING POWDER

Silver chloride	1 tola.
Common salt	1½ tolas.
Washing soda	8 „
White chalk powder	2½ „

Powder each separately and weigh in a well dry condition and mix well the whole and pack it in 1 oz. size screw top or wide-mouthed cork bottle.

For silvering the articles made of brass, copper, German silver, etc., first clean them well with chalk powder and wash with clean water. After cleaning the article from dirts and traces apply this silvering powder with a small piece of clean cotton rag when the article is wet. Rub briskly all over the place with this powder for some time and wash with water. Two or three coats in this way will give a good deposit of silver on the articles. To get cleaner and brighter surface on the article it must be cleaned thoroughly before applying this powder.

NEEM SOAP BY COLD PROCESS

Coconut oil	20 srs.
Castor oil	2 „
Neem oil	3 „
Chaulmoogra oil	1 sr.
Caustic soda lye 40°Be	13½ srs.
Soap green	2 dr.
Now take boiling water q.s. to dissolve:—	
Ichthyol	1 lb.
Thyme oil	4 oz.
Oil citronella	4 „

Put the oils into a suitable vessel, mix the medicines and stir in the lye. Then add the colour and stir until the mixture thickens. Now pour into the frame.

DEODORISING SPIRIT

Spirit	1 gal.
Powdered quicklime	½ oz.
Powdered alum	2 „
Wood charcoal	1 „

Mix all together and keep aside for a few days in a covered vessel and then filter.

TAPIOCA JELLY

Wash thoroughly 10½ oz. of tapioca and then soak it for 5 to 6 hours in 1½ pints of fresh water; add the peel of one lemon and place the whole on the fire. Boil slowly until a clear solution is obtained, and then flavour it with lemon juice, wine, and sugar.

TARAL ALTA

Rhodamine B Extra	2 oz.
Brilliant crociene	1 „
Rectified spirit	4 „
Glycerine	1 oz.
Glue	2 „
Water	40 „

Soak the glue in a portion of the water for a couple of hours; then warm and mix the remaining water. Raise the temperature to boiling point and add the colours and glycerine. Then set aside to cool. When cold add the spirit and bottle.

BABY TOILET POWDER

Boric acid	90 parts.
Fuller's earth	100 „
Zinc oxide	200 „
Corn starch	100 „
Orris root powder	200 „
Lycopodium powder	200 „
French chalk	100 „
Rose oil	1 part.
Bergamot oil	6 parts.
Neroli oil	2 „
Heliotropin	1 part.

Mix all the ingredients together and pass several times through fine sieve to ensure thorough mixing. Finally put in tins or packets as desired.

PISTACHIO ESSENCE

Essence of almond	2 fl. oz.
Tincture of vanilla	4 fl. oz.
Oil of neroli	1 drop.

Shake together, allow to stand 24 hours, and filter.

POMEGRANATE ESSENCE

Oil of sweet orange	3 parts.
Oil of cloves	3 „
Tincture of vanilla	15 „
Tincture of ginger	10 „
Maraschino liqueur	150 „
Tincture of coccionella	165 „
Distilled water	150 „
Phosphoric acid, dilute	45 „
Alcohol, 95 per cent, quantity sufficient to make	1,000 „

Mix and dissolve.

RASPBERRY ESSENCE

Fresh raspberries	200 grams.
Water, distilled	100 „
Vanilla essence	2 „

Pulp the raspberries, let stand at a temperature of about 70°F., for 48 hours, and then add 100 grams of water. Fifty grams are then distilled off, and alcohol, 90 per cent, 25 grams, in which 0.01 vanillin has been previously dissolved, is added to the distillate.

Formulas, Processes & Answers

ALUM BLOCKS

1200 M. W. M., Mahim—Wants to know a process of making alum blocks.

Dissolve 100 oz. of alum in small quantity of water. Add to it 1 oz. menthol dissolved in a little spirit and mix with 1 oz. of glycerin. Then heat the mixture on a water bath to evaporate the water. As soon as almost the whole of water has been evaporated pour the hot mass into rectangular moulds and set aside to crystallise. After a day or two take out the blocks and rub their surface with hot water to make them smooth.

ANTI-RUST PAINT

909 S. L. A. C., Bikaner—Wants a formula of preparing anti-rust paint.

Asphaltum	10	lbs.
Resin	5	„
Solvent naphtha	5	gallons.

Heat the asphaltum in a large iron pot until melted. Then add the resin and stir with a laddle. When the mixture is about to boil remove the pot from fire and while still warm add the solvent naphtha. If the paint is too thick to dry quickly, add a little turpentine oil.

ASBESTOS-CEMENT PRODUCTS

1535 K. Mysore—Wants to have a process of making asbestos-cement products.

The manufacture of asbestos-cement product is comparatively simple. The cement is purchased ready to use from the works, but the asbestos must be thoroughly disintegrated prior to use. To this end, it is first introduced into a set of edge runners, for the purpose of separating the individual fibres. This is accomplished by two granite rolls running on a best stone. Depending upon the consistency of the asbestos used, this separating takes from ten to forty minutes. Following this operation, the asbestos concentric moving drums of other moving elements by which the fibres crushed by the rolls are still further separated.

The loose asbestos fibres are next introduced, together with cement and a generous amount of water, into a pulp engine, which works the whole up into a liquid pulp. If a coloured product is desired then the colouring matter is added at this stage. From this machine, the liquid mass is run through an agitating drum, a mixer and over troughs to the plate or board machine.

This machine is the heart of an asbestos cement factory, and upon its operation depends not only the quality of the final product, but the performance of the entire plant. The machine is composed of the wire part and the wet press section. The wire part contains several sieves, which dip into the liquid mass and lift a thin film of it on to a wide endless felt band. The water is sucked off through the felt, while the solid mass is continually wrapped in a number of layer around a roll until the desired thickness is attained.

At this point the cylinders are removed from the rolling and are kept into a storage room, where they remain for some 28 days to allow the setting process to be completed. Asbestos pipes, however, continue hardening with time in this respect resembling mortar which grows continually strong with age.

PERFUMED BETELNUTS CHIPS

7072 B. C. H., Bombay—Wants to have a recipe of perfumed betelnut chips.

Pulverise several betelnuts. Then mix with sufficient quantity of glycerine so as to moisten the powder. Next add a little pink colour, which should, of course, be harmless. Lastly add a small amount of menthol, eucalyptus oil, etc. to perfume the substance as delicately as possible.

BLEACHING POWDER

833 M. A., Cawnpore—Wants to know a process of making bleaching powder.

This is a compound of calcium chloride and hypochlorite containing also water and free lime. In manufacturing bleaching powder of good quality the lime must be carefully slaked so as to form slightly moist powder, as perfectly dry lime does not absorb chlorine at all. The slaked lime thus prepared is spread in 3 or 4 inches layer on the floor and shelves of a large "chlorine chamber" which is 6 feet high, 10 feet wide and 20 to 100 feet long. The sides and top of the chamber are made of sheet lead fastened on wood work like sulphuric acid chambers. The front is covered over with asphalted iron plates. The chamber is provided with two windows which allows the interior to be seen. The chlorine gas either prepared directly or obtained as a by-product in the electrolytic processes is led into the chamber from one end; an opening on the other end allows the air to escape; the flow of the gas is turned off as soon as the chamber is full and at the same time the outlet is also closed.

The chlorine enters through a pipe placed at one end near the roof of the chamber; being heavier than air it sinks downwards and is, at first, rapidly absorbed by the lime; later, the absorption diminishes considerably with rise of temperature. Great care must be taken so that the temperature may not be above 25°C. Moreover, the amount of chlorine introduced into the

chamber should be regulated that a definite amount must be present within the chamber. In order to expose a fresh surface the lime is turned over from time to time with a ladle. The reaction is complete within 24 hours; during all this time the room is kept closed. Before taking out the bleaching powder, the residual chlorine should be removed by sprinkling into the chamber some finely powdered lime dust, which absorbs most of the chlorine.

The bleaching powder is then packed into wooden casks for transport and storage.

BRASSING SMALL IRON ARTICLES

979 G. L. K., Cawnpore—Wishes to know a process of brassing small iron articles without electricity.

To brass small articles of iron or steel drop them into a quart of water and ½ oz. each of sulphate of copper and protochloride of tin. Stir the articles in this solution until desired colour is obtained.

CARBON ROD

895 A. M., Amritsar—Wants to have a process of making carbon rods.

Carbon rods can be made economically only by the use of expensive machinery and apparatus, such as pulverizing mills, hydraulic press and retorts or ovens; but the amateur can make them with a little expense in the following manner. The materials required are wheat, coke, flour, molasses or syrup, and water. The tools consist of a moulds or tubes and piston for condensing the material in the tubes and forcing it out, and an iron mortar, or some other device, for reducing the coke to powder. Clean pieces of coke should be selected for the purpose, and such as contain no volatile matters are preferred.

Now pulverize the coke and pass through a fine sieve. Mix thoroughly with ⅛ to ⅛th its bulk of wheat flour, both being in a dry state. Next damp the mixture with a little water and keep the powder thus moistened in a closed vessel for 2 or 3 hours to prevent evaporation of the water. At the end of this time force the mixture through tubes by means of piston. Allow the rods to dry slowly at first, afterwards rapidly, in an ordinary oven at a high temperature. When the rods are thoroughly dried they are packed in an iron box and completely surrounded by coke dust to exclude air and to prevent the combustion of the rods during carbonizing process.

Then close the box with a non-combustible cover and place it in a furnace to red heat. Keep cold, open the box and boil the rods for half an hour in syrup or molasses diluted with a little water. They are again baked in an ordinary oven and afterwards carbonized again. This latter process of boiling in syrup and re-carbonizing is repeated until the required density is secured. As some gases are given off during carbonization, it is necessary to leave the box unsealed to allow these gases to escape.

CARDBOARDS

1202 S. C. R., Jalpaiguri—Desires to learn a process of making cardboards.

These are manufactured out of waste paper. For a superior variety, rags are used in the proportion of 30-40 % of the weight of the waste paper. In the case of white cards, the pulps are fully bleached and toned white by the addition of a small dye. For file boards the pulps are dyed in different shades and sized with 4 % rosin and 6 % alum and loaded with 10 % or even more, china clay or French chalk. The sheets are .016" inch in thickness. The usual size is large imperial 23" × 32" or half imperial 23" × 16" or small half imperial 22½" × 15". Each imperial size sheet weight 4 to 5 ozs. to each sheet. The paper may be coated with starch paste and plate glazed in a calender or hand glazed on a burnisher to produce high glazed surface as in the case of cards. File boards not be weak or brittle as they have to undergo considerable handling.

DEODORISING NEEM OIL

1138 S. K. S., Benaras—Wishes to learn a process of deodorising neem oil.

When neem oil is intended to make into soap it is better to boil with caustic soda solution and grain with salt or rather wash the soap with salt twice or thrice. In the process of boiling and washing the odoriferous substances will almost completely be ousted from the resulting soap. After the oil is completely saponified and washed it is fit to be mixed with the other soaps or boiled with other soap-stocks in the pan. But when the oil is not intended for soap-making it may be deodorised by the following way :—(1) Treatment with caustic lye and salt; (2) passing steam through; (3) animal charcoal treatment; (4) filtration. (1) put 10 lbs. of oil with 3 lbs. of water in a pan; heat the liquid upto 100°F add to it caustic soda solution of 38°B 1/10 lbs. (i.e. 1 %) and stir for 2 or 3 minutes when the oil will turn opaque Add salt about 1 lb. and boil. Remove the scum until the oil is nearly clear. If the froth is too thin to be removed add more salt when it will be concentrated and easily removable. When no more dirty foam is visible remove the oil from fire and decant when settled.

DYE SOAP

Dye soap is prepared by taking 1 lb. of common white or coloured yellow soap, mixing with it aniline dye 1 drm. and dissolving it in 2 oz. of gin and 2 oz. of water, then working up the mass in a clear paste and moulding it to the desired shape with stamps on.

Melted soap	1	cwt.
Aniline dye	1	lb.
Boracic acid	3	lbs.
Glycerine	5	"
Egg Albumen	1	lb.

Dissolve the boracic acid in boiling water, crutch well in the melted soap, then crutch in the colour and glycerine mixed with the albumen. When the soap is nearly cold, run into moulds.

EOSINE

Fluorescein		15 grams.
Bromine	33 grams. or	11 c.c.
Alcohol		60 grams.

Put the fluorescein in a flask, add the alcohol and then drop in slowly from a small, separating funnel. When half the bromine has been added, the dibromine which is formed is in solution; but on further addition of bromine, the titrabromide separates out. After standing for 2 hours filter the precipitate, then wash first with alcohol then with water and convert into sodium salt by mixing with a little hot water carefully neutralising with caustic soda (avoiding an excess of this reagent), and evaporating to dryness on water bath.

FLUID FOR SOLDERING BRASS, COPPER, ETC.

To the ordinary zinc chloride, prepared by digesting chips of zinc in strong hydrochloric acid to saturation, add ½ spirits of sal ammoniac and ½ part rain water, and filter the mixture. This soldering liquid is especially adapted to the soft soldering of iron and steel, because it does not make rusted spots.

To solder zinc, the zinc chloride may be used without any spirit sal ammoniac.

GOLD CHLORIDE

To prepare gold chloride take gold 1 part, and dissolve it by the aid of gentle heat over charcoal in aquaregia 6 parts in a porcelain or enamelled cup. Next evaporate the solution nearly to dryness and set aside to crystallize.

GRINDING STONE

Emery stones are prepared with emery powder using magnesite as binding medium. The feature of this process is that the pulpy mixture of magnesium chloride solution, magnesite and emery powder is placed in metal moulds, which are mounted on a jig-table, the vibration of which causes the specifically heaviest portion of the mixture, viz, the grains of emery, to settle down gradually to the bottom of the mould as compactly as possible, each grain having time to assure the most suitable position with regard to its neighbours. The process gives an emery-stone consisting of 90 per cent. of emery and only 10 per cent. of magnesite binding medium, the superfluous portions of the latter being forced upward by the movement of the table, and then easily removed.

HAIR DYE

1152 P. P. L., Quilon—Wants to know a good hair dye formula.

Diamidophenol hydrochloride	150	grms.
Sodium sulphite	250	„
Rectified spirit	100	c.c.
Distilled water	900	„

Mix. To apply wash the hair with soap to remove oil and grease and dry. Then apply the dye with a soft brush. When the desired shade has developed, wash the hair with shampoo.

BLEACHING HOSIERY GOODS

987 I. H., Pabna—Desires to know a process of bleaching hosiery goods.

Cotton hosiery goods are bleached by means of bleaching powder, being first boiled with soap and soda ash. Many operations are required, but the bleach, being an oxidising one, is permanent.

Mixed goods must be bleached by the per oxide bleach which is an ideal method for all fabrics but is more expensive. For the peroxide bleach, the bath is made up with a 5 per cent solution of sulphuric acid and 4½ per cent of sodium peroxide is added with stirring. The bath must be made alkaline with ammonia The goods are entered at 120°F. and allowed to remain in the bath for several hours, and are lifted, rinsed and slightly acidified.

INSECT POWDER

916 B. D. Howrah—Wants to have a formula of insect powder.

The ordinary insect powder of commerce is made from pyrethrum carneum, pyrethrum roseum, and pyrethrum cioraiae folium. The first two are generally ground together forming the Persian insect powder of commerce while the third is known as Dalmatin insect powder.

The powder is obtained by crushing the dried flowers of the pellitory (pyrethrum). The leaves, too, are often used. They are cultivated in the Caucasus from where the articles are exported.

The following insect-powder formulas are perfecty safe to use.

I

Oil of pennyroyal	2	fl. drachm.
Insect powder	8	oz. av.
Powdered borax	8	oz. av.

Take the ingredients in fine powder and then mix them intimately in a stone mortar; finally pass through a sieve to ensure thorough mixing.

II

Insect powder	8	oz. av.
Borax	8	„ „
Sulphur	4	„ „
Oil of pennyroyal	2	fl. dr.

Procedure :—As in I.

JINTAN

1109 N. J. V., Murtizapur—Wishes to have a process of preparing Jintan and Jujubes.

Menthol	160	gr.
Sugar	10	oz.
Liquorice	50	„
Otto of rose		q.s.
Musk	1 to 2	gr.

First grind the liquorice into very fine powder and then mix it thoroughly with sugar in a stone mortar. Then add the menthol and make into small globules. Finally add the musk and otto of rose just sufficient to form a delightful odour.

Next allow the pills to dry otherwise they will shrink away from the coating and leave it a shell easily crushed off. When dry, take starch, gum arabic, and white sugar, equal parts rubbing them very fine in a stone mortar, and if damp drop up the substances first before they are rubbed together. Then mix with it a few grains of cochineal or any other harmless colour to impart a pink colour to the mixture and transfer the whole into a suitable box for shaking. Now put a few pills into a small tin box having a cover and pour in them just a little syrup, shaking well to moisten the surface only; then introduce into a box of powder, and keep in motion until completely coated, dry and smooth.

In this operation you should be very much careful otherwise you will get too much syrup upon the pills; if you do, put more pills and be very quick about it to prevent moistening them too much, getting them into the powder as soon as possible.

JUJUBES

The name jujube is applied to a soft mass of acacia and sugar, without gelatin. This is generally used as a throat lubricant and for medicament. The method of making jujubes is as follows :—

Gum acacia	32	lbs.
Sugar	14	"
Water	2	gallons.

Warm together by steam until, with occasional stirring, the gum and sugar are dissolved. When solution is effected, the preparation must be steadily heated until it attains a proper pourable consistency. When it is approaching point the colouring and flavouring materials are added, the whole well mixed, and poured to the depth of about half an inch into oiled tin trays. The trays are then put in drying rooms for a period varying from 4 to 6 or 7 weeks, when the jujube is cut into long or diamond shaped pieces. The crystallisation of gum goods is done by putting the jujubes into special crystallising tins, and filling the tins with a bloodwarm syrup consisting of 24 lbs. of sugar and a gallon of water. At the end of 12 hours the syrup is drained off and the jujubes dried.

For flavouring jujubes the following substances are generally used :—

Oil of orange flower, extract of liquorice, oil of lemon, oil of menth-pipe, etc.

LATEX DOLL COMPOSITION

857 J. B. R. P., Poona—Desires to know a recipe of latex doll composition.

Rubber latex (60 %)	167	parts
Sulphur	2	"
Zinc oxide	5	"
Blanc fix	20	"
10 % Casein solution	5	"
Accelerator P. P. D.	1	part
10 % Ammonia solution	6.75	"
Teepol X	0.25	"

Proceed in the same manner as toy balloons.

LICE KILLING POWDER

1268 A. K. S., Dacca—Wants to know formula of lice killing powder.

Sulphur	1	oz.
Carbolic acid	½	"
Crude naphthol	1	"
Chalk powder	1	lb.

Mix.

LIPSTICK

Cetyl alcohol	1½	lbs.
White petrolatum	2½	"
Ceresin	1	lb.
Coloured lakes	12	oz.
Perfume	3	"

Mix the first three ingredients over water bath. Then incorporate the colour and perfume Lastly pour into gun metal or brass moulds.

MANURE FOR PAPYA PLANT

Castor cake	200	lbs.
Nitrate of soda	150	"
Bone meal	150	"
Wood ash	100	"

Use 600 lbs. per acre early in June.

METHYLENE BLUE

910 T. A. G., Cawnpore—Desires to know a formula of methylene blue.

Dimethylaniline	24	grains.
Hydrochloric acid, conc	65	"
Sodium nitrate	71	"
Zinc dust	20	"
Sodium thiosulphate	50	"
Potassium bichromate	25	"
Sulphuric acid, conc	53	"
Sodium chromate, neutral	8	"

Dissolve 12 grams of dimethylaniline in a mixture of 4 c.c. of water and 65 grams of concentrated hydrochloric acid, and cool the solution with ice to 12°—15°C. Stir the mixture and slowly run in the sodium nitrite, taking care that the temperature does not rise above 150°C. The compound thus formed is next reduced by carefully adding the zinc dust added must be sufficient to neutralise the hydrochloric acid, so that the blue litmus paper is no longer turned red. The solution is now diluted with water to 500 c.c. and a solution of 12 grams of dimethylaniline in the exact quantity of hydrochloric acid necessary to form the hydrochloride added, and then a solution of 50 grams of sodium thiosulphate in a little water.

Now oxidise the mixture by adding a concentrated solution of 25 grams of potassium bicarbonate and boiling for 2 hours.

Now pour the sulphuric acid being diluted with 100 c.c. of water and boil so as to expel sulphur dioxide formed in the reaction.

Next oxidise the leuco-methylene blue by adding the neutral sodium chromate dissolved in a little water and precipitate the resulting dye by the addition of salt.

Again, filter the base, dissolve it in a little boiling water to which a little hydrochloric acid has been added and again precipitate by common salt, filter and finally dry on a porous plate.

OMUM WATER

1171 P. N. E. R., Ootacamund—Wants to have a process of making omum water.

Ajowan seeds	3	lbs.
Water	6	qts.

Put the ajowan seeds in a cloth bag and then place it in the water in a distilling vessel. Next go on heating and collect the distillate in a suitable vessel. Distil for 4 or 5 hours. The distillate is known as omum water.

PHOTO ON SILK

822 S. S. F., Sandalankawa—Desires to learn a process of photography on silk.

In making photo on silk, China silk is thoroughly and carefully washed to free it from dressing and then immersed in the following solution :—

Sodium chloride	4	parts.
Arrowroot	4	„
Acetic acid	15	„
Distilled water	100	„

Dissolve the arrowroot in the water by warming gently, then add the remaining ingredients. Dissolve 4 parts of tannin in 100 parts of distilled water and mix the solutions. Let the silk remain in the bath for 3 minutes, then hang it carefully on a cord stretched across the room to dry. The sensitizing mixture is as follows :—

Silver nitrate	90	parts.
Distilled water	750	„
Nitric acid	1	part.

Dissolve. On the surface of this solution the silk is to be floated for 1 minute, then hung up till superficially dry, then pinned out carefully on a flat board until completely dry. This must, of course, be done in the dark room. Print, wash, and tone in the usual manner.

SEN SEN

966 R. T., Colombo—Wishes to have a formula and process of making sen sen.

Extract of Liquorice	1	oz.
Refined sugar	½	„
Menthol crystals	5	gr.

Otto of rose according to taste.

Essence of musk according to taste.

Grind extract of liquorice into fine powder, then mix it with sugar and finally add menthol and make into small cubes. Otto of rose and musk essence are to be taken in suitable quantities.

SLATE PENCILS

900 M. C. P., Palakonda—Wants to have formulas of making slate pencils.

Powdered slate	60	parts.
Powdered limestone	30	„
Sodium silicate	10	„

Knead together all the ingredients to form a plastic mass and then force it through metallic tubes of suitable diameter filled with pistons. Afterwards cut off into small lengths and bake over a slow fire.

SOLDERING STAINLESS STEEL

803 A. K. M., Bankura—Desires to know a process of soldering stainless steel.

All of the USS Stainless Steel grades can be soldered by customery procedures. Soft soldered joints, when not strengthened by double seaming, spot welding, or riveting should not be depended upon to resist mechanical loads or shocks and should serve only as closures to liquids and gases. Soldering is suggested only where corrosive conditions are relatively mild, such as in joints exposed to the atmosphere and water.

The ordinary lead tin solder composed of 50 % of each metal is quite satisfactory. The operation, however, may be performed somewhat faster with a higher tin grade known commercially as 60-40, because of its lower melting point.

The adherence of the solder depends very largely on the character of the surface of the metal to be welded. Rough surfaces such as No. 1 Finish, provide better adhesion than smooth surfaces such as are found in No. 2B and polished finishes. In soldering smooth surfaces, it is customery to roughen the areas to be covered, either with a file, coarse abrasive paper, or by etching. For this, a water solution of approximately 50 parts of ferric-chloride in 100 parts of concentrated hydrochloric (muriatic acid) is often used. The solution be applied only to the areas to be soldered and not to be allowed to run on to adjacent areas. It shoud be allowed to stand for five to fifteen minutes before soldering.

Stainless steel sheets may be soldered with or without tinning, although tinning the edges is preferable.

There are several commercial grades of stainless steel soldering flux on the market which perform nicely. Also, the usual acid flux consisting of commercial hydrochloric acid mixed with zinc, with or without an addition of 10 % commercial acetic acid, is satisfactory. A solution of approximately 10 % phosphoric acid is preferred by some fabrications, since it is a weaker acid than hydrochloric acid and claims are made that it provides better joints. The flux can best be applied with a brush and care again should be taken not to coat excessive areas.

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

MAKING MONEY IN A SHOP

935 S. C. B. R., Madras—Wishes to be enlightened on how to make money in a shop.

The most important factor about making money happily in your shop is your attitude towards it. Too many people enter shop life because they think it is an easy way of making money. You buy goods at one price and sell them at another, and the balance is profit. Actually, making money happily in a shop is one of the hardest ways of choosing a living, but it is also one of the most interesting things.

The fascination of meeting a lot of people, of building up your shop sales of struggling to master and come out on top of a thousand and one problems that beset the average shop keeper, is perhaps the main reason for success in a shop.

The second reason for success in a shop is understanding your public. It takes pluck to buy, and it takes skill to buy the right goods. Wrong buying kills the shop at birth. All successful shops are built up by skilful, plucky buying and thousands fail because of the failure to accept this first fact.

The second reason for success in a shop is understanding your public. It takes pluck to buy, and it takes skill to buy the right goods. Wrong buying kills the shop at birth. All successful shops are built up by skilful, plucky buying and thousands fall because of the failure to accept this first fact.

Some people think buying is a gift—outwardly it is, but I have never met a skilful buyer who is not a master of his line, and his mind. This skill was not gifted at birth. It has been built up by long study, careful analysis, wise observation and a ready willingness at all times to recognise mistakes one of the most difficult things to bring oneself to be in a ship.

The third reason for success in a shop is a desire to grow. Folk who start a shop as a heaven, generally make it a cemetary, where they bury their fondest hopes. As will read, there are many ways to grow, as long as you will grow. On the law of average your shop is but your lengthened shadow. As you grow inside, the shop gives that evidence in outward visible form.

Making a shop pay is a full and absorbing task, for to make it more, calls for hard thinking allied to hardwork. Successful shops pay more when they reflect prosperity. Even if you are having a bad time, begin to think good times. Get outside your shop the first opportunity and ask yourself " Does my shop radiate prosperity?" Because although the public ought to help the shop that needs help the most, it generally patronises the shop that looks as though the shop confers the favour by being open.

Make your shop look what you want it to be. Remember, the onus is on you and not on the customer. If the customer does not deal with you as you want him to deal, it is your fault. Make your store active, prosperous and good-looking. Show movement and vitality. If necessary paint up and clean up. Dress windows more often; send out more samples. Have competitions among the salesmen. Do something to let the public know you are moving.

NOTICE

We are glad to announce that for the convenience of our readers and customers of both East and West Pakistan we have appointed Sri Phani Bhusan Chakravarty of Joypurhat, Bogra, East Pakistan as our sole representative for both East and West Pakistan. All our readers and customers in Pakistan are requested to send all remittances to him and send us intimation to that effect.

Manager,

INDUSTRY PUBLISHERS LTD.,
22, R. G. Kar Road, Calcutta-4.

Queries and Replies

580 B. B. B., Digboi—Process of manufacturing rubber stamp will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/12/- including postage. For rubber stamp making apparatus enquire of Rubber Seeven & Co., 156, Cornwallis Street; V. D. Agency, 4-B, Peary Das Lane and Victoria Rubber Stamp Mfg. Co., 23, Canning Street; all of Calcutta.

581 B. R. S., Jodhpur—Following is a process of manufacturing soft soap: Linseed oil 25 lbs.; Groundnut oil 25 lbs.; Rosin 5 lbs.; Caustic potash lye 22°Be 50 lbs.; Caustic soda lye 22°Be 14½ lb.; Pearl ash 2¼ lbs. Take the oils and rosin in an iron vessel and heat. When the temperature is about 100°C slowly run in the caustic potash lye with constant stirring. Add water small quantity at a time to make up the loss of water caused by evaporation. When the mass boils add the caustic soda lye and continue boiling. Take care that the oil mixture does not boil over. When the oils and lye are well-amalgamated add the pearl ash dissolved in 5 lbs. of water so as to keep the mass thin. When the soap is clear and transparent it is ready to be poured in suitable container.

582 M. Z., Hyderabad—We have no book dealing with mantle manufacture. Mantles are knitted from artificial silk fabric cut into suitable lengths and stitched. These are next dipped in the following impregnation—Thorium nitrate 1000 parts; Cerium nitrate 10 parts; Magnesium nitrate 1½ parts; Beryllium nitrate 5 parts; Distilled water 2000 parts. Mix. The time of immersion of the artificial silk mantles varies from about 2 minutes to about 13 minutes according to the nature of artificial silk.

583 H. M. C., Kakinada—For supplying graphite you may negotiate with the following graphite dealers: Bengal Supply Co., 23-24, Strand Road, Calcutta; Calcutta Modern Traders Ltd., 22, Canning Street, Calcutta; G. Daw & Sons, 228, Harrison Road, Calcutta; Jamuna Coal Trading Co., Khattrana Street, Farrukhabad and Keymer Bagshawe & Co. Ltd., 22, Strand Road, Calcutta. For pulverising plant enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

584 G. S. M., Ludhiana—Your previous letter is not traceable. Please repeat your queries when answer will be published in these columns.

585 T. S. S., Barsi Town—For ready made dress, write to Abdur Razzaq Mullick, 2, Chandni Chowk; K. B. & Co., 11 & 12, Chandney Chowk and Kur & Co., Chandni Chowk; all of Calcutta.

586 J. E. W., Amritsar—We have one book on metal casting named Practical Metal Casting by D. De published from this office, price Rs. 3/12/- including postage. We have no book dealing with the manufacture of spun pipe.

590 D. B., Jaipur—Process of manufacturing fountain pens will be found in Mechanical Industries published from this office, price Rs. 3/12/- including postage.

591 L. S., Indore City—Wirenails are manufactured by Indian Steel & Wire Products Ltd., Indranagar, Singbhum and Hind Wire Industries, Ekeiord Road, Sukchar, 24 Parganas and Bombay Wire Nails Co. Ltd., 21, Daduseth Agiary Lane, Bombay. For coal shovels enquire of Tata Iron & Steel Co. Ltd., 102-A, Netaji Subhas Road, Calcutta. For gum arabic enquire of Banshidhar Dutt, 126, Khengrapatty Street, Caclutta. Screw may be had of A. M. Mullick & Co., 84A, Netaji Subhas Road, Calcutta; British Screw and Bolt Works, 33, Narsingh Dutt Road, Howrah; Fateh Chand Jainy & Co. 45/156, Generalganj, Kanpur and National Screw & Wire Products Factory, Belur, Howrah. Hinge making machines may be had of Francis Klein & Co. Ltd., 1, Royal Exchange Place Calcutta.

592 A. P. S., Patna—Tin cans may be had of Metal Box Co. of India Ltd., 41, Chowringhee Road, Calcutta; Bengal Tin Box Mnfg. Co., Ltd., 1, Jadunath Mitter Lane, Calcutta-4 and Colour Printing and Holloware Works Ltd., 243, Upper Circular Road, Calcutta.

593 P. R. G., Calcutta—To prepare stannous chloride dissolve granulated tin in concentrated hydrochloric acid, with the aid of gentle heat. The operation may be conducted in copper vessels, as the two metals in contact in the volatile currents which result in the more rapid solution of the tin. The liquid on being concentrated deposits crystals containing two molecules of water.

595 T. L. P. V. M., Kakinada—Following is a list of paint and varnish manufacturers: Acme Paints & Industrial Works, Co-operative Insurance Bldgs., Sir P. Mehta Road, Bombay; Mermaid Paints Ltd., Alice Bldgs., Hornby Road, Fort, Bombay; New Era Paint Works, Opp. Byculla Station, Byculla, Bombay; Calcutta Paint, Colour & Varnish Works, 8, Chunapukur Lane, Bowbazar, Calcutta; N. Haldar & Co. Ltd., 22/1/1, Jeliatola Street, Calcutta; Jenson & Nicholson (India) Ltd., 2, Fairlie Place, Calcutta and Napier Paint Works Ltd., 3, Mott Sil Street, Calcutta.

596 A. C., Bankura—For learning poultry you may enquire of United Provinces Poultry Association, Dilkhusha Cantt., Lucknow.

597 M. N., Parvatipur—You may consult Industry publications.

598 S. C., Guntur—Factory of Alembic Chemical Works is at Baroda.

599 A. N. S., Moradabad—For isobutyric acid enquire of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta. Many formulas are published regularly in every issue of Industry. But if you want the formula to be sent by post please send Re. 1/- stamp.

600 G. S., Allahabad—Following is a formula of sparklers: Fine steel filings 12 parts; Fine aluminium powder 1 part; potassium per chlorate 6 parts; Dextrin or gum arabic 2 parts. Water to suit. The steel must be protected from corrosion with paraffin. The gum should be made of the consistency of muci lage. Mix the ingredients thoroughly and add gum solution until a mixture is obtained that will adhere to the wires when they are dipped into it. This varies in different sections and with different runs of ingredients. In practice bunches of wire are dipped at once and slowly withdrawn in a current of warm dry air which causes the mixture to adhere evenly.

600 P. K. D., Calcutta—Following is a process of making catchets: Catchets are also known as wafers. These are prepared by mixing wheat or rice flour with sufficient water to produce a thick viscous fluid. Thing is then spread thinly over a steel plate moistened with grease to prevent the sheet from sticking. The mass is next dried over hot steam. When dry the sheets are taken out and cut into small discs by means of a punch, medicament is put over a disc and another disc slightly moistened over at its circumference with water is pressed over the forma. The catchets thus produced may be taken in by the patient with no better taste on the tongue.

601 B. A. R., Bolpur—Chemicals required for fountain pen ink manufacture may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Butto Kristo Paul & Co. Ltd., 1 & 3, Bonfield Lane and Allied Agency, 16, Bonfield Lane; all of Calcutta. Dyes may be had of Fuzzle Hussein & Bros., 44, Armenian Street and Champalal Agarwala, 45, Armenian Street; both of Calcutta. Ink pots may be had of Bimal Bottle Stores, 130, Radha Bazar Street; Bengal Glassware Supply, 66, Ezra Street and Satya Charan Paul, 194, Old China Bazar Street; all of Calcutta. Cardboard boxes may be had of S. Antool & Co. Ltd., 91, Upper Circular Road, Calcutta-9 and Amitava Trading Corporation, 301, Upper Chitpore Road, Calcutta-6.

603 K. S. R., Calcutta—To prepare synthe tic indigo heat aniline with chloro acetic acid of equal proportion for 1 to 2 hours whereby phenyl glycerine is obtained. This is then fused sodamide (prepared) by heating metallic sodium in a stream of ammonia gas, which should be collected and used again. To obtain indigo the indoxyl still in the fused state is dissolved in water, and air blown through to oxidise and condense the indoxyl to indigo or the solution is acidified so as to give free indoxyl, which is then oxidised and condensed in indigo.

604 R. K. M., Ferozepur City—For celluloid paint enquire of Jenson & Nicholson (India) Ltd., 2, Fairlie Place and Macfarlane & Co. Ltd., 102/1, Netaji Subhas Road; both of Calcutta.

605 K. P. D., Waltair—Knitting machines may be had of Dawn & Co., 11, Portuguese Church Street and Knitting Machine Syndicate, 25-26, Waterloo Street; both of Calcutta.

606 C. R. D., Calcutta—Following is a list of gunny dealers: Adhikary & Co., 21A, Canning Street; Ballabram Badrinarain, 15 Pagayaputty Street; Bansal Brothers Ltd., 14-1, Clive Row; Bhagwandas Chandprosad, 159, Chittaranjan Avenue, Calcutta; Hessian Exchange, 98-2, Netaji Subhas Road and J Thomson & Co., 8, Mission Row; all of Calcutta.

607 S. A. M. F., Allahabad—After mould ing you shoud temper the key for protecting against quick breaking. You may also make keys of mild steel.

608 P. K. R., Delhi—Following is a formula of hair curling fluid: Potassium carbonate 40 gram; Borax 10 grams; Mucilage of traga cantn 100 c.c.; Coumarin 5 grams; Methyl acetophenone 1 gram; Alcohol 100 c.c.; Rose water 744 c.c. Dissolve the borax and potassium carbonate in 500 c.c. of rose water, mix the other ingredients and add the remainder of rose water to make up the volume to 1000 c.c.

609 R. L. M., Bombay—Following is a formula of tooth powder: Precipitated chalk 35 parts; Magnesium carbonate 24 parts; Borax 14½ parts; Sodium bicarbonate 14 parts; Soap powdered 4 parts; Sugar, powdered 7½ parts; Methyl salicylate ½ part; Menthol 1/10 part; Cinnamon oil ⅛ part. Dissolve the menthol in the methyl salicylate, add the cinnamon oil and then add to borax and mix with sugar. Add to other ingredients; mix and sift.

610 V. P. R., Calcutta—When an ink marking on glass is desired, an effective for this purpose is easily made with the following formula: Glycerin 40 parts; Barium sulphate 15 parts; Ammonium bifluoride 15 parts; Ammonium sulphate 10 parts; Oxalic acid 8 parts; Water 12 parts. The viscosity may be adjusted with water. Use the mixture in a hood or a well-ventilated room. To speed the action, upto 8 p.c. of sodium fluoride may be added.

611 P. T. P. W., Nandyal—We have no book dealing with the manufacture of ceramics. For book on chinaware manufacture enquire of Prof. H. M. Bose, Banaras Hindu University, Banaras.

612 P. C. B., Calcutta—Honey in bulk may be had of Bakhat Bahadur & Bros., Chowk, Shahjahanpur City; Bhan Brothers Ltd., Srinagar, Kashmir; Chamba Honey Co., Chamba, Via Dalhousie, Himachal Pradesh; Gobardhan Joshi, Malli Bazar, Almora; Fairways, P. O. Box 16, 51, Srinagar, Kashmir and Jyotiswarup Surendramohan, P. O. Ramnagar, Nainital.

613 J. E. O., Barnagore—The enamel paints can be made by mixing varnish and pigments. The oil varnish is heated and reduced about 25 to 35 per cent by the evaporation of spirit and the colours are added while the varnish is hot. For a white paint either white lead, zinc white or barium sulphate is used with larger quanti ties of turpentine and some china clay if a matte surface is required. Driers are so added, manganese borate being a favourite substance. The following formula is generally recommend ed: Zinc white 15 lbs.; White lead 8 lbs.; Oil varnish 1½ gallons; Oil of turpentine 1½

gallons; Rosin 3 lbs.; Blue a trace; Manganese borate or calcined zinc sulphate 4 to 10 oz.

614 F. I. L., Madras—Following is a list of sculptors: B. L. Vaish & Son, Jhori Bazar, Agra; Behari Lall & Sons, Near Lawries Hotel, Pertabpur, Agra Cantt.; Bholanath & Sons, Drummond Road, Agra; G. Paul & Sons, 40, Kashi Mitter Ghat Street, Calcutta; Llewelyn & Co., 81, Waterloo Street, Calcutta and Rising Sun & Co., Kishenpole Bazar, Jaipur City.

615 M. C. J., Ajmer—Refer your query to the Secretary, Indian Journalist Association, P4, Ganesh Chandra Avenue, Calcutta.

616 B. C. A., Jodhpur—In order to produce naphthalene balls the purified naphthalene is carefully melted at a low heat in an ordinary melting pot and ladled into the moulds with an iron ladle. Great care must be taken in melting the substance because at a high temperature it will ignite and burn causing a great loss to manufacturers. In casting, iron and wooden moulds are generally used. These are made in two halves connected together with pins; in each half a number of hemispherical depressions are sunk in a line with a tube connecting them all together. At one end of the mould is a hole drilled for pouring, in the melted mass. On cooling, the liquid is solidified into balls, which may be separated by breaking off the attached pipe.

617 M. G. G. L., Patna—Tin cans may be had of Bengal Tin Box Manufacturing Co. Ltd., 1, Jadu Nath Mitter Lane, Calcutta-4 and National Sheet & Metal Works Ltd., 36A, Sahitya Parishad Street; both of Calcutta.

618 S. B. R., Chaibasa—Following is a process of making gum arabic mucilage: Gum arabic 100 parts; Water 140 parts; Glycerine 10 parts; Acetic Acid (dilute) 20 parts; Aluminium sulphate 6 parts. Dissolve the gum in the water and add the glycerine. Afterward add the acetic acid and the aluminium sulphate and mix thoroughly. Let stand a while then pour through a hair sieve. This mucilage is very strong partaking somewhat of the qualities of glue or gelatine solutions.

619 R. L. B., Patna—Following is a list of type foundries: Auto Type Foundry, 1, Niroae Behari Mullick Street; Baroda Type Foundry, 22-5B, Jhamapukur Lane; Bengal Type Foundry, 28A, Keshab Ch. Sen Street; Eastern Type Foundry, Oriental Printing Works Ltd., 18, Brindaban Basak Street; N. N. Sanyal & Sons, 28A, Keshab Chandra Sen Street; Sree Type Foundry, 8B, Lal Bazar Street; Sun Type Foundry, 116, Lower Circular Road and Rudra & Co., 32, Madan Mitter Lane; all of Calcutta.

620 B. L., Bombay—Following is a list of tailors; A. Jalil & Sons, 51, Bertram Street; A. Majid & Co., 179, Park Street; A. Margani, 1, Lindsay Street; Barket Ali & Bros., 12-C Gaulstaun Mansion, Park Street; De Dass & Co., 30, College Street; Francis Morrison & Co., 45, Dharamtalla Street; K. B. & Co., 11 & 12, Chandney Chowk; Kar & Co., Chandni Chowk; M. A. Kassim, 33, Bertram Street and S. B. Burdhan & Co., 97, Chandney Chowk; all of Calcutta.

621 R. C. P., Ahmedabad—Following is a formula of Kasturi pills: Cardamom 10 oz.; Cloves 10 oz.; Cinnamon 10 oz.; Nutmeg 10 oz.; Mace 10 oz.; Cubeb 10 oz.; Catechu 10 oz.; Camphor 1 oz.; Musk 1/10 oz. Take the ingredients in fine powder and thoroughly mix. Put the whole in a mortar and make it a stiff paste by adding rose water. Bray well for some time. Take this and make it into small pills of 2-3 grains each and dry it in shade.

622 M. R., Madhubani—Bottles may be had of Bengal Glassware Supply, 66, Ezra Street; Bimal Bottle Stores, 130, Radha Bazar Street; Radha Bazar Bottle Stores, 15, Radha Bazar Lane; Satya Charan Paul, 194, Old China Bazar Street and P. S. Dutt & Bros., 8, Ezra Street; all of Calcutta.

625 A. R., Karachi—Following is a formula of marking ink: Copper sulphate 20 oz.; Aniline hydrochloride 30 oz.; Dextrin 10 oz.; Glycerine 5 oz.; Water q.s. First mix dry ingredients and then mix in glycerin and just enough water to make a smooth paste of proper consistency for use with a fine brush.

626 N. T. C., Bombay—You may consult Manufacture of Inks and Manufacture of Disinfectants and Antiseptics published from this office, price Rs. 3/12/- each including postage.

628 B. K. S. G., Mekliganj—Shoes may be had of Globe Tannery, 31/9, Lower Chitpur Road, Calcutta; National Factory, 81, Bentinck Street, Calcutta; Sadake Shoe Factory, 24, Lower Chitpur Road, Calcutta; Bhalla Shoe Co., Meston Road, Kanpur; Himalaya Chappal Co., La Touche Road, Kanpur; Kohinoor Boot & Shoe Factory, Agra; London Shoe Factory, Mandi Saeed Khan, Agra and Chamber Shoe Factory, Chamber Bldgs., Shoe Market, Agra.

629 N. P., Patna—We have no book on engineering line and on smithy. You may however enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

630 E. G., Dowki—For lead balls, caps for toy pistols enquire of Bepin Behary Dass & Grandsons, 63, F. & G. Radha Bazar Street, Calcutta; Hari Charan Dass & Co., 63H, Radha Bazar Street, Calcutta and Sat Cowrie Dass & Co., 196, Old China Bazar Street, Calcutta. For tissue paper enquire of Bholanath Ltd., 32A, Brabourne Road, Calcutta; Raghunath Dutt & Sons Ltd., 33-2, Beadon Street, Calcutta and S. N. Ghose & Company, P-7, Old China Bazar Street, Calcutta. In case of brass you may adopt soldering process whereas in case of iron you may use welding process. Following is a formula of meal powder: Saltpetre 15 parts; Charcoal 3 parts and sulphur, flour 2 parts. Pulverise the ingredients very finely separately and mix thoroughly.

631 A. K. S., Ahafo-Kenyasi—We do not deal in any article. We only sell our publications. For Japan Yens you may communicate with an exchange bank.

632 J. L., Bagdogra—We have no book dealing exclusively with fruit tree growing. An exhaustive article on fruit growing in India

appeared in April, 1953 issue of Industry. If you go through the article you will get much information about fruit tree growing.

635 U. C. M., Khurda—You may start oil extracting business. This will require about Rs. 20,000/-. For machines enquire of Marshall Sons & Co. Ltd., 33, Netaji Subhas Road and Bhartiya Engineering Works, 370, Upper Chitpur Road; both of Calcutta.

636 G. S. K., Kanpur—You may start small industries collecting ideas from our magazine "Industry."

638 G. M. S., Visakhapatnam—Glasswares may be had of Bimal Bottle Stores, 130, Radhabazar Street; Radha Bazar Bottle Stores, 15, Radha Bazar Lane and Nath & Bros., 67, Radha Bazar Street; all of Calcutta. Metal cans may be had of Metal Box Co. of India Ltd., 41, Chowringhee Road, and Bengal Tin Box Mnfg. Co. Ltd., 1, Jadu Nath Mitter Lane; both of Calcutta.

640 W. V. D. M., Nellikuppam—Wants to be put in touch with the dealers in cashewnut kernel and oil.

641 R. D. S., Darjeeling—Silver nitrate may be had of Allied Agency, 16, Bonfield Lane and Calcutta Chemical Co. Ltd., 10, Bonfield Lane; both of Calcutta. Chloride of tin may also be had of the above firms. We do not deal in article, we only furnish information to our readers.

642 B. K. M., Surat Manufacture of Rubber Goods published from this place contains processes of manufacturing all sorts of rubber goods from rubber tyres to nipples.

643 S. C., Chittagong—For mantle knitting machine enquire of W. H. Brady & Co. Ltd., Mercantile Bldgs., Lall Bazar, Calcutta. Mantles are knitted from artificial silk fabric, cut into suitable lengths and stitched. These are next dipped in the following impregnating solution: Thorium nitrate 100 parts; cerium nitrate 10 parts; Magnesium nitrate 1½ parts; Baryllium nitrate 5 parts; Distilled water 2000 parts. Mix. The time of immersion of the artificial silk mantles varies from about 2 minutes to about 15 minutes according to the nature of artificial silk. Grinding stones are made with latex as the binder. Following is a formula for the same: Carborandum grains 300 parts; Rubber (from latex) 100 parts; Sulphur 20 parts; Accelerator 2 parts. Cure 2 hours at 287°F. To the latex mix made from this formula is added a solution of zinc acetate or other coagulant, the mass being stirred until it has a cheese-like consistency. It is then moulded to shape, dried and vulcanized to the hard rubber stage.

644 D. V. S. R., Gollaprolu—Soap and tablet making machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

645 P. K. R., Burdwan—Following is a formula of soft soap: Linseed oil 25 lbs.; Groundnut oil 25 lbs.; Rosin 5 lbs.; Caustic potash lye 22°Be 50 lbs.; Caustic soda lye 22°Be 14½ lbs.; Pearlash 2½ lbs. Take the oils and rosin in an iron vessel and heat. When the temperature is about 100°C slowly run in the caustic potash lye with constant stirring. Add water small quantity at a time to make up the loss of water caused by evaporation. When the mass fobs add the caustic soda lye and continue boiling. Take care that the oil mixture does not boil over. When the oils and lye are well amalgamated add the pearlash dissolved in 5 lbs of water so as to keep the mass thin. When the soap is clear and transparent, it is ready to be poured in suitable container.

646 R. G. P., Calcutta—Following is a recipe of flavouring cigarette tobacco: Calamous 2 oz.; Orris root 6 oz.; Essence of white rose 6 dr.; Lavender oil 20 mins.; Rose geranium 40 mins.; Alcohol (70 p.c.) 40 mins. Exhaust the powdered solids by percolation with the alcohol to 2 pints, and add the other ingredients.

648 M. R. P., Saran—We have no book dealing with the manufacture of mantle. Process of manufacturing mantle will be found under No. 643 above.

649 B. L. P., Jullundur City—Processes of manufacturing boot polish, cheap soap, fountain pen ink, etc. will appear in due course.

650 B. R. P., Jullundur City—Formulas of DDT powder, anti ant powder, white ant destroying powder, etc., will appear in due course.

651 A. C. B., Satna—Biri making machine may be had of Inventor's Industrial Corporation Ltd., 1, Rup Chand Ray Street, Calcutta.

652 K. K. A., Wadakkancherry—For wind mills enquire of Martin Burn Ltd., 12, Mission Row, Calcutta.

653 R. L. H., Delhi—We have no book dealing with the manufacture of mantle. Process of manufacturing mantles will be found under No. 643 above.

654 J. E. O. F., Coonoor—You may try the following formula for manufacturing disinfectant similar to Dettol: Cresylic acid 50 lbs.; Creosote oil 6 lbs.; Sulphonated castor oil 5 lbs.; Gelatin 3 lbs., Water 36 lbs. Dissolve the sulphonated castor oil and gelatin in the water and gradually add to them the mixture of cresylic acid and creosote oil with vigorous agitation in small quantities at a time. Final treatment with a colloid mill may be necessary to obtain a good dispersion.

655 F. M. S., Calcutta—Mill stores may be had of Das & Co., 22, Canning Street; India Trading Corporation, 56, Netaji Subhas Road, Mill Stores & Belting Co., 40, Netaji Subhas Road; Patel Brothers, 34, Strand Road; Solomon & Co., 28, Strand Road and Stores Supply Syndicate, 20, Strand Road; all of Calcutta.

656 T. P., Berhampur—Following is a formula of sizing for yarn: Stearic acid 15 parts; Soap 2.5 parts; Gelatin 2.5 parts; Soda ash 3 parts; Starch 10 parts; Water 400 parts. Tallow may be had of Calcutta Tallow Supplying Co., 19, Tiretta Bazar Street and Premier Lard Supplying Co.,

P48, Grey Street; both of Calcutta. Sizing material may be had of Allied Agency, 16, Bonfield Lane; Calcutta Chemical Co. Ltd., 10, Bonfield Lane; Indo-European Agency Ltd., 67, Ezra Street and Keymer Bagshawe & Company Ltd., 22, Strand Road; all of Calcutta.

657 D. N. S., Katni—You may write to Automobile Engineering Institute, 13, Dacres Lane, Calcutta and French Motor Car Co. Ltd., 243-3, Lower Circular Road, Calcutta.

658 D. M. C., Jhargram—For rice hullers enquire of General Rice Machinery Stores, 85A, Netaji Subhas Road, Calcutta; M. N. Mandal & Co., 67, Madhu Sudan Biswas Lane, Howrah; Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta; and Reliance Trading Co., 36, Grand Trunk Road, Sibpore, Howrah. Process of manufacturing manures will be found in Manures and Their Application published from this office, price Rs. 2/12/- including postage.

659 V. C., Ankamali—Palastic goods may be had of Hindusthan Plastics Co., 8, Royal Exchange Place, Calcutta; M. B. Industries, 14/2, Old China Bazar Street, Calcutta; Peerless Plastics Industries Ltd., 4, Upper Chitpur Road, Calcutta and Plastics & Machinery Distributors, 4, Upper Chitpur Road, Calcutta.

660 D. C., Bhopal—Betelnut cutting machine may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta. For hydrogen gas producing plant enquire of Bengal Chemical & Pharmaceutical Works Ltd., 94, Chittaranjan Avenue, Calcutta and Adair Dutt & Co. Ltd., Stephen House, 4, Dalhousie Square, Calcutta.

661 P. P. M., Masulipatam—You may consult Manufacture of Soap, price Rs. 4/12/-, Manufacture of Ink, price Rs. 3/12/- and Manufacture of Toilet Goods, price Rs. 4/12/- all the books published from this office. We have no book dealing with blending of perfumes.

662 G. B. T., Cuttack—We publish a number of books on industrial, technical and commercial subjects.

663 Q. S. M. H., Nawadah—Silvering of glass is now-a-days carried out by spraying with a mixture of silver nitrate 3 oz.; Aqueous ammonia 3 oz. and water 128 oz. and a reducing solution comprising a salt (sulphate) of hydroxylanine 2¼ oz. aqueous ammonia 1 oz. and water 100 oz. and 2 oz. of glyoxal in 1 gallon of water.

664 Q. S. M. H., Nawadah—You have to erect machines for starting rice, flour and oil mills. Machines may be had of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; Marshall Sons & Co. (India) Ltd., 99, Netaji Subhas Road and Volkart Bros., 8, Netaji Subhas Road; all of Calcutta.

665 M. B. M. C. L., Bombay—Separators for battery may be made from any wood having straight fibres. Separators made of Indian timbers are boiled in 2 p.c. aqueous solution of caustic soda for 2 hours. The separators are then removed from the hot solution, washed and again boiled in fresh solution of one per cent caustic soda for 2 hours. The separators are then removed from the bath, washed in water and boiled repeatedly in distilled water, till the last trace of alkali is removed. These are then drained and superficially dried by interposing a blotting paper and pressing under a hand press. The separators are then given a dip in a bath of glycerine to which has been added a small amount of an antiseptic (Rosha grass oil 2 parts; thymol 1 part) at about 105—110°C for about 15-20 minutes. The separators after draining off the glycerine are washed in running water for a few minutes and stored, while wet, by wrapping in waxed paper.

666 K. I. N. C. W*d*, Delhi—You may consult Small Industries published from this office, price Rs. 2/- including postage.

668 M. R. A., Hubli—According to Hirze dilute sulphurous acid is an excellent agent for destroying bed bugs and their eggs as well as other noxious insects. It is sufficient to sprinkle a few drops of the acid upon the places or into the joints and holes infested by the insects, and to repeat this several times.

669 B. B. C., Calcutta—Following is a formula of lustre polishing bar: Tallow 1 lb.; Red ferric oxide 2 oz.; Oxalic acid 2 dr.; Pumice powder 2 oz. Powder the acid, and mix with oxide and pumice powder. Then incorporate into the melted tallow. Lastly press the mixture in suitable moulds. The oxide and pumice must be quite free from grit, or it may produce scratches on the surface of polished metals.

670 R. B., Hyderabad—For gas producing plant you may enquire of Bengal Chemical & Pharmaceutical Works Ltd., 94, Chittaranjan Avenue, Calcutta, and Adaire Dutt & Co. Ltd., Stephen House, 4, Dalhousie Square East, Calcutta.

671 S. C. S., Banaras—Printing ink making raw materials may be had of A. D. Coomar & Sons, 12C, Clive Row; B. Goswami & Sons, 40/1 Netaji Subhas Road and B. K. Dutt & Co., 25, Netaji Subhas Road; all of Calcutta.

672 F. I. R., Bombay—Following is a formula of motor car wax polish: Carnauba wax 120 parts; Kerosene oil 50 parts; Stearic acid 15 parts; Oleic acid 3 parts; Benzaldehyde 6 parts; Triethanolamine 8 parts; water to make 825 parts. Melt the carnauba wax, stearic acid and oleic acid. Remove from fire and add the kerosene oil and benzaldehyde. Stir thoroughly. Now add a hot solution (80°—85°C) consisting of 240 parts of water and triethanolamine. Stir well until a smooth emulsion is formed, then add sufficient hot water to make 825 parts. Continue stirring until nearly cold; then bottle.

673 R. K. B., Ranaghat—Motor accessories may be had of Adams Motor Works, P37, Theatre Road; Bharat Motors, P39, Mission Row Extension; Calcutta Motor Part Co., 12, Waterloo Street; Eastern Auto Parts Co. (Calcutta) Ltd., 61, Bentinck Street; French Motor Car Co. Ltd., 234-3, Lower Circular Road and Howrah Motor Co. Ltd., Mission Row Extension; all of Calcutta.

674 F. G. H. B., Hubli—For dry fruits enquire of the following firms: Delawar Jan Mohd. Ariff, 12, Ramlochan Mullick Street; Fazar Mahmud Ali Ahmed, 13, Ramlochan Mullick Street and S. K. Ghulam Rasul, College Street Market; all of Calcutta. Plastic sheet may be had of Peerless Plastics Industries Ltd., 4, Upper Chitpur Road; Plastics & Machinery Distributors, 4, Upper Chitpur Road; both of Calcutta; Nutex (India) Ltd., Devkaran Mansion, Princess Street, Bombay and K. A. Zaveri & Co., 80, Princess Street, Bombay-2.

675 F. I. R., Calcutta—Following is a formula of ink for stamping on balloons: Nigrosin 3 grm.; Water 15 grm.; Glycerine 80 grm.; Alcohol q.s.; Lamp black q.s. Dissolve the nigrosin in the water; add a few grm. of alcohol and then the glycerine. To this mixture add, with constant trituration, enough lampblack to make a thick cream. Dilute this to the desired fluidity with alcohol. Nigrosin may be had of Champalal Agarwala, 45, Armenian Street and Fuzlehussein & Bros., 44, Armenian Street; both of Calcutta. For alcohol enquire of A. M. Arathoon, Stephen House, Dalhousie Square East, Calcutta and Bengal Breweries Ltd., 6, Mission Row, Calcutta.

676 Q. B., Banaras Cantt.—Following is a formula of making lustre polishing bar: Tallow 1 lb.; Red feric oxide 2 oz.; Oxalic acid 3 dr.; Pumice powder 2 oz. Powder the acid, mix with oxide and pumice powder. Then incorporate into the melted tallow. Lastly press the mixture in suitable moulds. The oxide and pumice must be quite free from grit or it may produce scratches on the surface of polished metals.

677 C. L. J., Agra—Process of manufacturing rubber solution will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/12/- including postage. Process of manufacturing boot polishes will be found in Prospective Industries published from this office, price Rs. 3/12/- including postage.

678 S. U. M. T., Muzaffarnagar—Mantles are knitted from artificial silk fabric, cut into suitable lengths and stitched. These are next dipped in the following impregnating solution: —Thorium nitrate 1000 parts; Cerium nitrate 10 parts; Beryllium nitrate 5 parts; Magnesium nitrate 1½ parts; Distilled water 200 parts. Mix. The time of immersion of the artificial silk mantles varies from about 2 minutes to about 13 minutes according to the nature of the artificial silk.

679 P. R. G., Jaipur—Following is a process of manufacturing artificial ivory: Mix with 8 parts of shellac with 32 parts of ammonia solution of specific gravity 0.994 and shake into solution in revolving cylinders for about 5 hours. The result of the operation will be complete solution of the consistency of thin syrup. Add to this 40 parts of zinc oxide mix thoroughly with the hand, and then grind the mixture in a colour mill. The ammonia is then expelled by heating. The residue is completely dried upon glass plates, ground fine in a mill and pressed into moulds with a pressure of as much as a ton to the square inch and an increase of temperature to about 40—60°. The product when taken from the mould, is of a pure white colour and closely resembles ivory.

680 U. M., Egarah—For registration of trade mark you may negotiate with Dutta & Co., 82, Harrison Road; Law Morris & Co., 19, Strand Road and L. S. Davar & Co., Norton Buildings, Dalhousie Square; all of Calcutta.

681 A. T., Mauritius—For red oxide of iron enquire of Tata Iron & Steel Co. Ltd., 102A, Netaji Subhas Road, Calcutta and Indian Iron & Steel Co. Ltd., 12, Mission Row, Calcutta and Mysore Iron and Steel Works, Bhadravati, Mysore.

682 C. P. M., Agra—For medicine for hernia etc. enquire of Kaviraj 1, Bhim Ghose Bye Lane, Calcutta-6.

683 G. E. W., Haldwani—Process of manufacturing storage batteries will be found in Manufacture of Batteries published from this office, price Rs. 3/12/- including postage. We have no book dealing with armature winding, dynamo repair and electrical system of the common motor cars. You may enquire of Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta.

684 T. R., Bombay—Mantles are knitted from artificial silk fabric, cut into suitable lengths and stitched. These are next dipped in the following impregnating solution: Thorium nitrate 1000 parts; Cerium nitrate 10 parts; Magnesium nitrate 1½ parts; Beryllium nitrate 5 parts; Distilled water 2000 parts. Mix. The time of immersion of the artificial silk mantles varies from about 2 minutes to about 13 minutes according to the nature of artificial silk. For macnines you may enquire of W. H. Brady & Co. Ltd., Church Gate Street, Bombay. Chemicals may be had of B. Babulal & Co., 52-58, New Hanuman Lane, Princess Street, Bombay and Imperia Chemical Industries (India) Ltd., Baliard Estate, Bombay. Artificia silk yarn may be had of Seth & Co., 381, Kalbadevi Road, Bombay-2 and Gordhandas Ishwardas, 93, Tambu Kanta, Pydhownie, Bombay.

685 B. N. D., Cachar—There is no arrangement for teaching manufacture of oil, ink, soap, etc.

686 S. B., Meerut—We have no book dealing with the manufacture of spray and enamel painting.

687 S. I., Indore—Process of manufacturing crayons will be found in Prospective Industries published from this office, price Rs. 3/12/- including postage.

688 N. L. S., Palanpur—There is no Government Laboratory where soap making formula is available. Soap making machine may be had of Small Machineries Mnfg. Co. 22, R. G. Kar Road, Calcutta. Soap making raw materials may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta. As regards book you may consult Manufacture of Soap published from this office, price Rs. 4/12/ including postage.

689 P. S. D. B., Calcutta—Following is a list of lampware manufacturers : A. K. Sarkar (Industries) Limited, 10 Hastings Street, Calcutta-1; Dazzle Products Ltd., 138, Canning Street, Calcutta-1; Govind Bansi Tapkiri Brass Lamp Factory, Nasik; Link Industries Ltd., Khaleel Mansions, Mount Road, Madras; Shilpa Peeth Ltd., 111/1, Gopal Lal Thakur Road, Calcutta-35 and Universal Lamp Manufacturing Co. Ltd., 93B, Ripon Street, Calcutta-16.

690 P. K. B., Madras—For hardware enquire of A. K. Abdullabhoy & Co., 319, Lingai Chetty Street, Madras-1; A. M. Badruddin & Co., 23, Linghi Chetty Street, Madras-1; Amar Trading Co., Post Box 1769, Madras-1; Fakhri Hardware Stores, 15, Linghi Chetty Street, Madras-1; H. Hasan & Co., 8, Sembudoss Street, Madras; M. M. Abbas & Bros., 7, Sembu Doss Street, Madras and S. Akbarali Haidarali & Co., 27, Linghi Chetty Street, Madras.

691 D. R. L., Bombay—Following is a process of dental amalgam : Amalgams for the teeth are made with gold or silver and mercury, the excess of the latter being squeezed out and the stiff amalgam used warm. It is stated that pure tin with a small portion of cadmium, and sufficient mercury, forms the most tasting and least objectionable amalgam. The following is the formula : Melt 2 parts of tin with 1 part of cadmium, run it into ingots, and reduce it to filings. Form these into a fluid amalgam with mercury, and squeeze out the excess of mercury through leather. Work up the solid residue in the hand and press it into the tooth.

692 D. P. M., Muzaffarnagar—You may mix the sandal oil with the compound and let the same mature for seven days before adding to the hair oil.

693 V. D. K., Belgaum—Composition of monel will appear in due course.

694 F. F. M. B., Calcutta—Following is a formula of mukh bilas : Cardamom 100 parts; Cloves 100 parts; Cinnamon 100 parts; Nut meg 100 parts; Mace 100 parts; Cubeb 100 parts; Catechu 100 parts; Camphor 10 parts; Musk 1 part. Reduce the ingredients separately into fine powder and mix thoroughly. Put all the substances together in a mortar and made it a stiff paste with rose water. Bray well for some time. Take this and make it into small pills of 2 to 8 grains each and allow to dry in shade.

695 S. K. P., Shivpuri—Following is a formula of fountain pen ink : Tannic acid 2½ oz.; Gallic acid 1 oz.; Ferrous sulphate 3½ oz.; Hydrochloric acid (dilute) 2½ fl. oz.; Gum arabic 2 oz.; Carbolic acid (dilute) 2½ fl. oz.; Gum arabic 2 oz.; Carbolic acid 85 grs.; Ink blue ½ oz.; distilled water to make 100 oz. Dissolve the tannic and gallic acids in 5 oz. of warm water. Dissolve the ferrous sulphate and gum arabic in about 20 oz. cold water. Add the hyrochloric acid and immediately mix the two solutions. Add the carbolic acid, ink blue and sufficient water to produce 100 ounces. Keep aside for a fortnight, then filter and bottle.

696 A. K. B., Madras—Following is a process of fire-proofing leather : The prepared leather is placed in an ordinary tanner's drum together with an amount of water equivalent to its own weight, preferably at a temperature of 50°C. Five pounds of aluminium sulphate previously dissolved are added to 100 lbs. of leather and drumming prolonged for a period of sixty minutes. At the end of this time, five pounds of sodium phosphate are added and the drumming continued for a period of sixty minutes, when the leather may be removed and washed preliminary to drying.

697 P. V., Vijayawada—For preserving decoction you should use 25 p.c. alcohol.

698 B. B. M., Arrah—Process of manufacturing boot polish will be found in Prospective Industries published from this office, price Rs. 3/12/- including postage. Carnauba wax and other waxes may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta and Banshidhar Dutt, 126, Khengrapatty Street, Calcutta. Colours may be had of Champalal Agarwala, 45, Armenian Street and Fuzlehussein & Bros., 44, Armenian Street; both of Calcutta. Tin cans may be had of Metal Box Co. of India Ltd., 41, Chowringhee and Tin Box Manufacturing Co. Ltd., 1, Jadu Nath Mitter Lane; both of Calcutta.

699 J. P. S., Muzaffarpur—You may take up manufacture of zarda and soap on small scale. As regards book you may consult Indian Tobacco and Its Preparations published from this office, price Rs. 3/12/- including postage.

700 D. N. B., Teok—For cementing plastic special phenolic amounts are recommended depending on the type of plastic. With the thermoplastics solvents may be used for cementing. Acetone with or without dissolved cellulose acetate has been used with success for the cementing of cellulose acetate parts. Ethyl acetate may be used with equal success on polystyrene parts. Accyloid B-72 cement has been used satisfactorily on parts moulded from vinyl plastics moulding materials.

702 B. P., Cuttack—For glass bottles and mould enquire of the following firms : Victoria Glass Works, 10, Clive Row, 3rd Floor, Calcutta, Imperial Glass Works Ltd., 9, Ezra Street, Calcutta and Hazra Engineering Co., 36, Brabourne Road, Room No. 36, Calcutta and Hind Glass Works Ltd., 35, Chittaranjan Avenue, Calcutta. For bakelite caps enquire of India Moulding Co., C2, Bharat Bhavan, 13, Chittaranjan Avenue, Calcutta and Swadeshi Industries Ltd., 33, Netaji Subhas Road, Calcutta.

INDUSTRIAL PRODUCTION

Industries		1952	Jan., to Oct., 1952	Jan., to Oct., 1953*	Sept., 1953*	October, 1953*	October, 1952
Major Industries.							
Coal	lakh tons	362.22	301.10	300 07	29.72	29.37	29.75
Steel	lakh tons	15.78	11.66	12.06	1.03	1.27	1.32
Yarn	million lbs.	1,418.30	1,187.00	1,255.10	129.00	129.00	122.30
Cloth	million yds.	4 603.20	3,782 50	4,112.20	407.00	409 00	387.80
Cement	lakh tons	35.27	29.18	30.73	3.08	3.29	2.92
		952	801	722	71	67	77
Paper	tons	1.27.504	1,02.287†	1,04,872†	12,306	—	11,917
Matches	cases	6,08,200	5,01,800	4.98 500	46,700	41,800	49,800
Sugar	lakh tons	1,419	1,188	1,160	0.2	1.4	7.9
Engineering and Electric Industries.							
Machine tools	value in lakhs of Rs.	44.37	36.74†	33.15†	4.05	—	3.88
Electric lamps	lakhs	208 81	152.97†	148.62†	16.01	—	20.07
Dry cells	crore Nos.	13.02	9.44†	10.84†	1.31	—	0.99
Transformers	k.v a.	2,14,800	1,51,200†	2,20.400†	30 500	—	15,900
Motors	h.p.	1,57,600	1,19,400†	1,27,100†	12,400	—	12,200
Electric fans	Nos	1,95,500	1,62,400†	1,57,900†	17 900	—	10,600
Radio receivers	Nos.	71,435	55,651†	41 977†	4,597	—	5,350
Storage battery	Nos.	1,58,400	1,20 400†	1,31,200†	16 500	—	10,600
Cables and wires—							
Copper conductors	tons	5,928	3,271†	5 891†	217	—	843
Winding wires	tons	398	297†	171†	13	—	36
Rubber insulated cables and flexibles	lakh yds.	328.6	234.8†	368.8†	35.6	—	30.3
Insulators—							
H. T.	Nos.	3,25,000	2,12,7[illegible]	4,19,900	51 100	47,100	45,900
L. T.	lakh Nos.	3,078	2,312†	1 685†	178	—	194
		4,246	[illegible]	1,9[illegible]5†	478	—	219
Chemical Industries.							
Salt	lakh mds.	76 86	[illegible]	83.51	2.46	1.35	1.87
Caustic soda	tons	17.058	13,803	17,524	2 199	2,265	1,490
Soda ash	tons	44,322	39,279†	41,752†	4,642	—	4,375
Chlorine liquid	tons	6 240	5 011	7,036	1,104	1,109	541
Bleaching powder	tons	792	657	1,547	206	204	24
Bichromates	tons	1,463	1,085†	1,566†	167	—	124
Sulphuric acid	tons	96,081	66,890†	75,825†	9,667	—	8 519
Superphosphates	tons	46,650	39,495†	30,693†	3,873	—	2,674
Non—ferrous Metals—							
Aluminium	tons	3,566	2,905†	2,531†	305	--	217
Antimony	tons	181	169†	83†	—	—	70
Copper	tons	6979	5,063	3 660	608	665	514
Lead	tons	1,132	931	1,319	171	150	108
Miscellaneous (Minor) Industries.							
Sewing machines	Nos.	50,045	40,409	43,857	6.184	3,706	3,566
Hurricane lanterns	lakh Nos.	35 23	28 09	35 24	3.50	2.87	2.61
Bicycles	Nos.	1,96,956	1,32,415†	1,83,417†	25,754	—	22,344
Cycle tyres and tubes	lakh Nos.	83.55	67.69	76.22	9.99	4.70	4.05
Motor tyres and tubes	lakh Nos.	13.83	11 79	11.90	1.44	0.88	0.38
Cigarettes	crore Nos.	2,058.85	1.547.51†	1,474.24†	156.47	—	167.42
Plywood—							
Tea chests	lakh sq. ft.	782.27	607.69†	371.30†	32.37	—	53.86
Commercial	lakh sq. ft.	122 58	87.62†	93 39†	4.79	—	10.61
Refractories	lakh tons	2.43	1.85†	1.69†	0.19	—	0.19
Abrasives	reams	55 600	35,500†	41,200†	4,100	—	5,600
Sheet glass	lakh sq ft.	90 12	48 0[illegible]	119.18†	21.56	—	7.60
Woollen manufactures	lakh lbs.	166.68	112.73	138.38	12.63	15.69	18.14
Footwear—							
Western type	lakh pairs	33.67	37.98	27.56	2.89	2.13	2.22
Indigenous type	lakh pairs	18.06	15.16	17.69	2.23	1.29	0.62
Alcohol—							
Industrial	lakh galls.	68.45	50.11†	45.08†	7 08	--	5.12
Power	lakh galls.	77.42	58.98†	61.29†	5.78	—	4.66

* Figures are subject to revision month to month.

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Industry

MONTHLY MAGAZINE

FORTY FOURTH YEAR OF PUBLICATION

CONTENTS FOR APRIL ISSUE

April issue will contain useful articles on commercial, industrial and technical subjects such as Industrial Production in 1953; Agricultural Progress in 1953; Manufacture of Beverages and Syrups; Furnaces used in Glass Manufacture; Manufacture of Photographic Mountants; Stabilization and Rancidity in Toilet Soap; Diseases of Adult Fowls, etc. in addition to the regular features such as Agricultural Tips; Scientific Researches and Inventions; Engineering Notes; Official India; Pharmaceutical Recipes; Recipes for Small Manufacturers; Formulas, Processes and Answers; Reader's Business Problems and Queries and Replies.

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All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

All enquiries regarding the Subscription or Advertisement Departments should be addressed to the General Manager.

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Editorial Department — 11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays

Subscription and Advertisement Department 10 A.M. to 5 P.M. on weekdays and 10 A.M. to 2 P.M. on Saturdays.

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- Button & Ivory
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- Cardboard Boxes
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- Cinema Distributors
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- Cycles & Cars
- Cutlery
- Dental & Optical Materials
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- Rubber Goods
- Rubber Stamps
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- Stamps & Coins
- Stocks & Share
- Soap Material
- Soap & Perfumery
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For "Organisers and Agents" on suitable terms, apply Oriental Provident Insurance Ltd., 10, Clive Row, Calcutta. Phone Cal. 7175. (19-43 AA)

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BOTTLES & CORKS

Bhagya Laxmi Glass Agency, P-33, Pollock Street, Calcutta—1, Telegram: "Bhagyaglas." Dealers in Bottles, Phials, Corks, Caps, Capsules Homeo-phials, etc. (20-14 BC)

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THE CENTRAL BUDGET

The Central Budget for 1954-55 reflects in the main an atmosphere of uncertainty which can hardly provide enough incentive to stimulate economic activity needed to fulfil the objectives of the Five-Year Plan. This is the view taken of it in general by the country's industrial cum trading sections of the population

Besides, the Budget falls back on the rather risky method of deficit financing. The Finance Minister, however, defends it saying that there is nothing else he could do in the prevailing circumstances. So long the Taxation Enquiry Commission has not been able to finish its work, " it is neither proper nor desirable to initiate any large-scale change in the present structure of taxation until the whole problem has been considered in the light of the Commission's recommendations." Even so, it is difficult to combat the view expressed by a well-known Bombay Weekly that the Taxation Enquiry Commission should have been appointed before the plan was launched, in which case we could have avoided 'paying the penalty of inadequate, if not haphazard, economic growth.'

Most progressive thinkers here have decried Prohibition as a costly fad. It has been estimated that Prohibition means a loss of revenue to the tune of Rs. 50/- to Rs. 60 crores. With prohibition off the programme, the need for deficit financing would not have been felt at all. Prohibition has forced State Governments to resort to regressive forms of taxation which have robbed private enterprise of incentives to growth and further development.

The nominal surplus of Rs. 45 lakhs anticipated a year ago, will be actually replaced by a deficit of Rs. 17 crores. Explaining it the Finance Minister says that the failure to receive the two instalments of debts due from Pakistan, aggregating Rs. 18 crores, is responsible for the deficit. He is confident of getting Rs. 9 crores from Pakistan for the year next revenue budget, certain items of grants to the States have been transferred to the Capital Budget. The revised estimates of expenditure for 1953-54, show a fall of Rs. 1.57 crores in the expenditure on the cost of revenue collection and Rs. 2.7 crores in the provision for Civil Administration.

Nation-building and development projects have received wholesome attention in the Budget. Our Government believes that the so-called Community Projects can change the face of rural India and bring about an all-round development of our rural economy. Nevertheless, it will be difficult for it to escape the charge that it has not yet thought fit to devote attention to the needs of urban economy, which are equally urgent. Much is being made at the present moment of the threat which is latent in the newly forged Pak-U. S. military alliance. But our Government is not prepared for the matter of that to inflate its Defence Budget. It will instead try to solve the problem of poverty and maintain friendly relations with the outside world and perhaps, it is banking on the idea that by so doing it can fight the menace of aggression best.

The Budget reflects beyond doubt the very limited scope of pushing up income by the imposition of taxes. Augmentation of indirect taxation will spell greater hardship for our impoverished millions. Export duties can no longer be looked upon as a fertile source of revenue, for if they are increased export promotion will be difficult to achieve. Import duties too will yield diminishing revenue with domestic industrialization advancing further. Excise duties will be increased in respect of certain commodities. But the wisdom of the move is questionable. Excise duties and sales tax have done more harm than good and these exactions are rightly resented by the country's trade, commerce and industry.

Even though the import duty on cotton has been abolished, the excise duty on all varieties of cloth has been increased. The import duty on betelnuts has gone up and soap, art silk and footwear have been brought under the sway of excise duty. Relenting, however, to demands for the reduction of duty, the Finance Minister has

announced certain concessions. In footwear, the exemption limit has been raised to apply to the non-power operated section of the industry employing upto 49 workers per day; in soap the first 125 tons of laundry soap and first 25 tons of toilet soap cleared from any taxable factories will be exempted; in art silk fabrics the duty is reduced and adjusted from being 1.5 annas per linear yard (excluding handloom cess at 3 pies a yard) to one anna per square yard (including handloom cess).

Deficit financing to the extent of Rs. 250 crores per annum seems quite a hazardous game to play. The danger of inflation it may bring about cannot be ignored altogether. Moreover, production within the country has not yet risen to a satisfactory level. The political climate again is not quite as it ought to be. The States have not yet succeeded in raising adequate resources nor are they spending the funds at their disposal in an effective manner.

We would, in conclusion, quote the Finance Minister's observations in defence of deficit financing which are as follows :—

"I have given the most careful thought to this question and, on a balance of considerations, I am convinced that in the conditions as they now are and are likely to be in the near future, we are not taking any undue risks in going in the manner I have indicated. In fact, deficit financing to a moderate extent is necessary under present conditions. The period of inflationary stresses is now well behind us and there are signs that the high levels of production we have attained in various lines—and which we would like to improve upon—cannot be sustained without some increase in money supply in the hands of the public. In judging the economic effects of the budgetary deficit, it has to be borne in mind that part of it might well be neutralised by a balance of payments deficit. For some time past, as I have indicated earlier, we have not, on balance, been drawing upon our sterling balances. This is an indication that the level of economic activity in the country so far is not high enough to create any large demand for external resources; in other words, the optimum level or tempo of development has yet to be reached. A country's balance of payments is subject to many uncertain and unpredictable factors, and there is always need for caution. Nevertheless, so long as the domestic price situation is well in hand, and there are internal reserves which can be drawn upon in case of need, deficit financing for development involves very little risk. Indeed it can be said that deficit financing, subject to safeguards, has a definite part to play in bringing into use the unutilised resources in the system. It was in view of these considerations and in the context of the recent increase in unemployment in certain sectors that the expansion of the Plan was decided on, and the budget proposals for the next year have been framed in pursuance of this decision. With domestic food production at a satisfactory level, and with the outlook for larger imports from abroad better, should need arise, the budgetary deficit envisaged will, I expect, prove reflationary rather than inflationary. If, however, major changes in the economic situation or climate take place, obviously, Government policies will have to be reconsidered. For the time being, I should say that, in the context of our developmental needs, it is important for us not only to live within our means but also to live upto our means."

NOTICE

We are glad to announce that for the convenience of our readers and customers of both East and West Pakistan we have appointed Sri Phani Bhusan Chakravarty of Joypurhat, Bogra, East Pakistan as our sole representative for both East and West Pakistan. All our readers and customers in Pakistan are requested to send all remittances to him and send us intimation to that effect.

Manager,

INDUSTRY PUBLISHERS LTD.,

[illegible]

TOBACCO INDUSTRY

Instances are by no means rare of an industry going off its feet on account of rumours and prejudices being set in motion against its interests. Some time ago the plastic straps which are used for wearing wrist watches fell a victim to the mistaken notion that they damage the human skin. The effect of this notion gaining currency did some damage to the plastic straps industry from which, we are told, it has not yet recovered fully. Vanaspati is another typical example. A recent victim of the type is the tobacco industry. But this time the villain of the piece is no John, Dick or Harry. It was the British Minister of Health who told his country's Parliament some time ago that the Standing Advisory Committee on Cancer and Radiotherapy had opined that it must be regarded as established that there is relation between smoking and cancer of the lung. Whatever the urgency of the warning young people against the dangers of inveterate smoking, the publicity linking smoking with cancer of the lung is reported to have adversely affected tobacco shares on the Stock Exchanges in both London and New York.

Out here in India the indigenous hookah and bidis still hold their sway. But in the urban areas the cigarette is coming into use on an abundant scale. Cheap quality cigarettes are being put on the market in quite an indiscriminate manner, and it makes a sad commentary that the Government thinks all its duty consists in filling the coffers with the proceeds of taxes on the sale and manufacture of cigarettes. No step has yet been taken to control their quality and taking advantage of this lacuna the tobacco trade and industry are out to fatten themselves on the people's growing fad for smoking the white looking 'stick' in preference to the brown *bidi* and the rather obsolete and and uncouth *hookah*. Most cigarette selling in our markets contain no more than a sprinkling of tobacco, the major portion of their contents being anything else than tobacco. *Bidis* too are not prepared in admirably hygienic conditions We do not see who else than the Government could be expected to set things right.

To return to the British Minister's statement. It created quite a stir among the leading tobacco manufacturers of London and they rushed to press with a statement trying to make the point that cancer of the lung is not necessarily due to smoking. Their statement said, "The disease occurs in those who have never smoked; the number who smoke and contract the disease is a very small proportion of those who smoke and do not contract it; the disease is much more common in towns than in country districts, yet there is no corresponding difference in the average amount smoked by people living in towns and people living in the country; and there are medical authorities here and in other countries who are laying emphasis on atmospheric pollution as a possible increasing cause of the disease."

PRIVATE ENTERPRISE

In his presidential address to the sixty-sixth annual general meeting of the Upper India Chamber of Commerce, Mr. G. E. Longdin expressed the desire that the Centre and States Governments should take such steps as would dispel the fear complex in the country's investing sector. Mr. Longdin kept the road followed by most private entrepreneurs when he expressed his disappointment at the series of "hasty legislations" passed by the

authorities to improve the lot of labour, to control irresponsible businessmen and to augment the volume of revenue.

Mr. Longdin said that the Government's failure to amend or expunge section 33 of the Industries Disputes Act was encouraging indiscipline among workers. He added that the Industries (Development & Regulation) Amendment Act, 1953, tended to restrict private enterprise. He feared that some of the provisions of the Companies Bill, 1953, might restrict the business activiy of some of the concerns.

Private enterprise has reasons to feel that it has received no better than stepmotherly attention so far from the Government. The cloud, however, is not without a silver lining which is now quite discernible. For example, one may refer to the appointment of the Taxation Enquiry Commission by the Government with a view to revising the country's structure of taxation. Then there is the Shroff Committee to enquire into the finances available for the private sector. The World Bank is evincing keen interest in the matter of starting an investment bank for providing risk capital to private industries and to help banks with accommodations necessary to keep them going as they should.

E. BENGAL'S PROBLEMS

The United Front which has come out triumphant almost in every constinuency in the recent elections, is laying stress on three of its demands—autonomy for East Bengal, dissolution of the present Consembly and recognition of Bengali as a State language of Pakistan. Besides the above political demands, the United Front is giving attention to certain important economic issues. The U. F. is committed to the removal of restrictions on border trade between East and West Bengal and withdrawal of the visa system. The visa system is responsible for much of the economic woes of East Bengal. As reported in *The Statesman*, hundreds of thousands of people who used to migrate to West Bengal for extra work in the agricultural off-season, cannot now do so. Like West Bengal, East Bengal too has a grouse against the allocation of taxes collected by the Centre.

A. U. F. L. leader, Mr. Hamidul Huq Chowdhury, one-time Finance Minister of East Bengal, has been heard to decry what he alleged as the Centre's attempts to strangle East Bengal's industrial potentiality. He pointed out that formerly East Bengal's cotton mills could get coal from Jharia, West Bengal, at Rs. 32/- to Rs. 35/- per ton. But to-day, due to Pakistan's insensate policy of importing coal from abroad, its price has gone as high as Rs. 110/- per ton. East Bangal cotton mills cannot compete with West Pakistan cotton mills because they have to import raw cotton from Western Pakistan. Cost of production being thus high, E. B. cotton mills face the menace of being closed. It is not known what view the U. F. is taking of the existing disparity in value between the Indian and the Pakistani Rupee. Mr. H. S. Suhrawardy is reported to have told Karachi pressmen recently that he would like the passport-visa system to be scrapped and the Rupee devalued.

How far successful the United Front will be in its efforts to re-shape things in East Pakistan, one can hardly guess aright at the present moment. One thing, however, is certain. The people there have already made known their verdict on the moslem League's triflings with their lot and it has a lesson for all concerned not only in Pakistan but here in the Indian Union also where people are smarting under a sense of grievance over thousand and one issues most of which are economic in character.

COMMUNITY PROJECTS

The Official Note on the progress of the Community Projects, which was releas-

ed some time ago, does not make an encouraging reading. It pleads inability to assess the progress actually made as full data have not yet been made available to the Community Project Administration. The Note says that there is tremendous enthusiasm among the people to make use of the projects with a view to bettering their lot. No doubt that this is a point to reckon with, for enthusiasm is a great spur to action.

The Official Note mentions certain handicaps which have retarded the progress of Community Projects. The need for a closer association between the members of the Projects Advisory Committees and the Project Authority is being felt. Then there is lack of co-ordination among the various departments of State Governments. Yet another defect is that some State Governments have been found wanting in preparation and planning to assist the villagers in their work under the projects. Delays have also occurred in the procurement of equipment from abroad. There is no doubt that if and when the projects are successfully implemented, India's rural economy will undergo an immense change for the better. But all concerned should be prepared to eliminate the handicaps mentioned in the official note or the projects are bound to lag far behind the goals which their authors had set themselves.

RICE MERCHANTS' DEMAND

The rice traders of West Bengal recently met at the Great Eastern Hotel and adopted a resolution urging the West Bengal Government to issue special licences to enable them to bring rice from abroad and from other States in India for sale to wholesale and retail dealers in the State. They wanted that either the Government should take upon itself the responsibility of procurement of foodgrains through its own machinery and eliminate handling agents and sub-agents, or allow rice mills in the State to supply to the Government its rice requirements at Rs. 14/4/- per maund and freely to sell the balance of their stocks throughout the State, including Calcutta and industrial area. Another resolution, adopted at the meeting, asked the Government to open a transit route to North Bengal through Malda for quick movement of foodgrains and other essential commodities to North Bengal.

INDUSTRIAL POLICY

Addressing the annual general meeting of the Employers' Federation of Southern India, its Chairman, Mr. E. F. G. Hunter said that from the point of view of new industrial development and the raising of necessary capital, as envisaged in the 5-year plan, it would be of great help to industrialists to have from the government an up-to-date declaration of its industrial policy. We shall be only doing our duty if we add in this connexion that the government's failure to do the needful cannot but create an atmosphere of uncertainty in the midst of which private enterprise is bound to be deprived of the proper incentive to development. Mr. Hunter referred also to the flow of fresh enactments most of which he said, resulted in a heavier financial burden on industry.

He said : "We and other employer organizations throughout India are only too anxious to make constructive suggestions to the Government on any new items of legislation and it seems to me but appropriate that the Government should welcome suggestions and or criticisms. I am confident that any constructive suggestions of considerable value to the Government would be forthcoming if all proposed legislations affecting industrial relations were referred to employer and labour organizations."

RUBBER INDUSTRY

The Indian Rubber Industry came into

being for the first time in 1920. Even so, it has been able to make rapid progress within the short space of 30 years. A short while ago the Indian Rubber Industries Association organised a Conference and an exhibition in Bombay to focus attention made by the industry and the problems now facing it.

It was in the thirties that the Indian rubber industry succeeded in helping itself on to its feet. To-day there are in this country about 130 solid rubber fartories and about 170 latex factories. All types of rubber goods from toy balloons to giant tyres and tubes are manufaltured by them. Consumption of rubber rose to 5,600 tons in 1938. By 1941, it rose to 14,292 tons. In 1951, it went up to 22,427 tons and in 1953, it fell to 22,373 tons. Rubber consumption here is steadily rising and the indigenous manufacturing concerns are not in a position to meet the rising demands of domestic consumption.

Figures for imports and exports given below also testify to the progress made by the country's rubber industry:—

Year	Import. Rs.	Export. Rs.
1939-40	148.42 lakhs.	9.53 lakhs.
1952-53	53.35 ,,	142.25 ,,
1946-47	26.65 ,,	275.26 ,,

The industry at present is complaining of a lack of testing facilities on account of which the industry is not finding it possible to utilize the latest skill of the technicians it has employed. Most indigenous rubber manufacturing concerns are run on a small scale and they cannot afford to have a testing laboratory of their own. They are, therefore, asking the government to set up a service laboratory in each centre.

The Indian Rubber Industries Association has prepared a skeleton scheme for setting up a reclaim rubber plant. At present reclaim rubber is imported from abroad. The country's waste rubber products ought to be utilized for reclaiming rubber and then we shall find it possible to stop the import of reclaim rubber. The Association's scheme contemplates the setting up of a reclaim rubber plant of a capacity of 2,000 tons a year. The Association also desires that the various materials needed by the industry should be supplied on an adequate scale, the commodity most needed being synthetic rubber.

GOOD WORK

Much good work is being done at the present moment by the Central Food Technological Research Institute. It is reported that it has evolved a number of new drinks, both alcoholic and non-alcoholic. Among its alcoholic drinks is a recipe for the preparation of a tonic wine and it is claimed that it will be as good as imported medicinal wine. Non-alcoholic beverages evolved by the Institute include a number of quality drinks based on fruits. They include ginger cocktail, passion fruit squash and cashew apple juice.

More details of the good work now being done by the Institute can be had from the following extract from a report which appeared in a leading Calcutta Daily some time ago :—

The Institute has also apparently found a solution to the prevailing milk shortage. Its vegetable milk from groundnuts, which can be converted into curds, butter milk and milk shakes is claimed to be palatable.

In the same category of unusual foods and drinks is synthetic rice, prepared from blends of tapioca and groundnut flour, which. it is claimed, " has a higher nutritive value than rice."

If produced on a sufficiently large scale, this preparation, it is stated, would considerably help the country in times of emergency. especially as tapioca yields three to four times as much of food per acre as grains.

The Research Institute's new food for

infants and invalids is malted milk, prepared out of a cheap millet called ragi, which grows abundantly in Southern India. Milk forms about 30 % of the product. But cow's milk can be substituted by vegetable milk, also a discovery of the Institute.

Another unfamiliar food has been made out of a common hedge plant which grows wild throughout the country. The stem of this plant. agava vera-cruz, is stated to be a rich source of fructose.

Now the Institute is working on quick and dependable methods for detecting adulteration in coffee, and on new techniques of coffee-making.

It has come to the conclusion that in order to obtain coffee of good aroma and taste, the " wetting technique " is the best. This consists of wetting the powder with water on the filter disc before adding boiling water for perculation. This method yields a geater percentage of coffee extract than in the normal way.

WEST BENGAL MILLS

The President of the Bengal Millowners Association. Fr. M. L. Shah requested the Government to withdraw control on production of cloth and of restrictions on the installation and work of additional looms in small and uneconomic units.

Mr. Shah holds that with the abolition of price and distribution controls and the consequent revival of normal trading conditions, the mills should be guided by the tastes and requirements of consumers. But so long as the production restrictions continue, mills can hardly find it possible to produce the varieties of the cloth which are the popular demand, consistent, of course, with the productive capacity of individual concerns. As a result they are bound to be faced with a heavy accumulation of stocks and blocking up of their capital. Mr. Shah has also criticised rightly the increase in the excise duty on cloth, particularly coarse and medium variety. The Government certainly knows that these types of cloth are usually consumed by the poor and it is a pity that those who loudly proclaim their pledge to build a welfare state could ever decide to do anything which might cause some extra hardship to the poor commonfolk.

Mr. Shah has also requested the Government to permit the existing uneconomic units in West Bengal to attain balanced sizes at least up to the extent of 600 looms and 27,000 spindles, so that they may bring down their cost of production to the level of similar mills in other advanced countries of the industry. He further points out that only 4 out of 16 composite mills in the State can be considered economic units.

Like most other textile magnates, Mr. Shah welcomed the decision of the Government to set up an All-India Council for the promotion of exports of cotton textiles. Mr. Shah believes that if effective steps are taken to produce goods at lower cost by all-round rationalization of the industry, there is no reason why it will not be possible for the country to increase its export target with the help and assistance of the Government. Mr. Shah feels happy over the fact that the production of cotton textiles last year had surpassed the Planning Commission's target of 4,700 million yards fixed for 1955-56.

At present the Government is bestowing deserving attention on the handloom industry and there are some millowners in this country who do not take kindly to that sort of thing. Mr. Shah, however, has not chosen to camp with them. He makes the constructive suggestion that for the protection of the handloom industry Co-operatives should be organised to market its products in the country and abroad. Regular supply

of yarn, dyes, chemicals, etc., to weavers should be ensured at cheap rates.

Mr. Shah expresses concern at the growing threat of unemployment and suggests that the commercial community of the State should work for rapid industrialization to counter it. But the point is that private enterprise can hardly be expected to come into its own or adequately supplement the all-too-meagre and even imperceptible efforts of the Government to take the bull of unemployment by the horns, unless the Government shows its readiness to create for it a favourable set-up aimed at promoting its growth and development. Mr. Shah shows his awareness of where exactly the shoe pinches when he makes the point that the new Companies Bill seeks to curb the freedom and initiative of managing agents and restrict and hamper the growth of legitimate business.

Manufacture of Ebonite Articles

The manufacture of ebonite articles is divided into the following branches: (1) Base and leather-hard plates; (2) sheets, rods, and tubes; (3) moulded goods, (a) Polished bulk articles, combs, etc., (b) unpolished goods, large mechanical articles, which are stable to heat and which do not shrink; (4) accumulator cases, linings (e.g., lining centrifuges), coverings (e.g., ebonite-covered pumps used in the manufacture of artificial silk).

Base and leather-hard plates are really midway between ebonite and ordinary soft rubber. Their manufacture require no special machines nor presents any especial difficulties. The important points are the correct choice of the quantities of sulphur and of oily filling materials in the mixings.

The production of true ebonite sheet, rod or tube, demands as its first step, the preparation of tinfoil. Tinfoil is one of the most important accessory materials in ebonite manufacture, and most factories make their own tinfoil. Banca tin is the most suitable metal to use, but many ebonite makers improve the malleability of the tin by the incorporation of about 3 per cent of lead. The tin is first melted in graphite crucibles and the dross carefully removed from the surface of the molten metal, which is then poured into frame moulds to produce ingots. These ingots are then rolled out in very powerful double-roller mills. These mills are similar in general design to the usual rubber mixing mills, but they are far more strongly built. Their rolls are polished and revolve rapidly and without friction. The tin ingots are rolled thinner and thinner until their thickness is about 2 mm. when they are transferred to the so-called tin calender, where the thickness is reduced to 0.2 to 0.3 mm. The calender also imparts a glaze to the tinfoil.

In making the foil, the workpeople must exercise great care, as the metal can be very dangerous. Open wounds infected by the tin can often give rise to incurable lameness or paralysis. The cost of installation of a tin-melting and a tinfoil rolling plant is very high.

The manufacture of ebonite sheet is carried out as follows: After the mixing has been made, it is run out to a sheet of the desired thickness on a three-bowl calender, the distance between the bowls which can be regulated to a tenth of a millimetre. The calender is also advantageously provided with a doubling roll on which one or more layers of the finished calendered material can be rolled one on top of the other. Care must be taken during the doubling operation that no air bubbles remain between the sheets, for these would give rise to blow-holes in the finished ebonite. The sheets are then transferred to a heated table to allow full contraction to occur before vulcanisation. The sheets are laid on tinfoil, brushed over with a suitable oil, covered with a piece of cloth, and subjected to the action of a heavy iron roller. The process is for the purpose of expressing any air from between the bottom surface of the rubber sheet and the tinfoil. Slow and uniform operation of the roller is essential if a sheet of uniform thickness is to be obtained. The cloth is then lifted off the sheet and a further layer of oil-coated tinfoil on the top of the rubber sheet. By a repetition of the rolling operation the air is removed from between the rubber and the top sheet of tinfoil. The purpose of using a layer of cloth

before rolling the rubber is twofold: Firstly, it prevents the rubber sticking to the roller and, secondly, the impression which the cloth fabric makes on the surface of the rubber sheet facilitates the removal of the air between the rubber and the tinfoil. The purpose of the rolling is not merely to remove all the air between the rubber and the tinfoil, but to avoid the possibility of any water getting in between the rubber and the metal during the vulcanisation. In some factories it is the custom to coat the edges of the foil with a solution of para rubber and to press these edges together, but this procedure is not really necessary.

The sheets are vulcanised in a large open steam pan. Several tin-covered sheets are laid on top of one another and a heavy iron plate placed on the topmost sheet to prevent any shifting during the vulcanisation process. When vulcanisation is completed, the tinfoil is stripped off the ebonite sheets. If the foil proves difficult to remove and if the sheets are found to have an unpleasing green colour, it may be concluded that the ebonite has not been vulcanised sufficiently. Correct vulcanisation is denoted by easy removal of the tinfoil and a polished surface of the ebonite. Porous and brittle ebonite sheets are a sure indication of over-vulcanisation. After being used once the foil must be re-melted, because contact with the rubber causes the formation of a layer of tin sulphide and destroys the smooth surface of the foil

The finished ebonite sheets are either worked-up in the factory (e.g. to combs, etc.) or they are sold to other manufacturers. In the latter case they usually receive a fine polishing before leaving the ebonite works. For sheets of the best quality tripoli earth can be used directly for polishing. For lower grade ebonite sheet, a preliminary removal of the non-polishable surface layer by means of pumice-stone is essential, the treatment with tripoli earth coming later. The grinding and polishing are carried out on the so-called buffing-wheels which are simply discs or wheels made up of layers of flannel. The best practice is to have mechanically-driven polishing discs, as these are not only conducive to great saving in time and labour, but by their use a more uniform degree of polishing is obtained. Polishing with a mixture of paraffin oil and tripoli earth gives the highest degree of lustre that is obtainable, but care should be taken, when carrying out this operation, that too much friction is not developed, lest the ebonite become heated and unpolishable.

Thick ebonite sheets are made by doubling sheets of 5 mm. thickness, giving the made-up sheets a preliminary vulcanisation between tinfoil and completing the vulcanisation in the steam pan without the covering of tinfoil. Many different types of mixing are used for the production of ebonite sheet. Only rarely (e.g., for insulating panels for wireless telegraphy, where sheets only (0.3 to 0.4 mm. thick have to withstand a voltage of 20,000 volts and over) are rubber and sulphur alone used. In general, ebonite sheet contains 15 to 20 per cent of ebonite dust (especially the thicker sheet which could not easily be made without such dust) and frequently other organic fillers. It must, however, again be emphasised here that only the best quality and most carefully examined dust should be used. Use of an unproved dust is not only likely to lead to defects in the finished ebonite, but may also influence the time necessary for the correct vulcanisation of the mixing.

The manufacture of ebonite sheet is not a highly attractive commercial proposition under present-day conditions, although the position has been improved somewhat by the demand for use in wireless receiving sets. The characteristic properties of ebonite, namely, its elasticity and high resistance to electricity have ensured, and should continue to ensure, its position in the wireless industry. Whilst in the case of small bulky articles elasticity is not such an essential property, in the case of objects with a relatively large superficial area, elasticity is an all-important property. The

manufacture of ebonite sheet, it will be seen from what has been said above, is relatively simple, the most important points being the choice of a suitable mixing, and the careful and skilful rolling of the sheet in the tinfoil.

THE MANUFACTURE OF EBONITE RODS AND TUBES

Tubes and rods are extruded on the tubing machine. The unvulcanised mixing, and also the machine, must be at a higher temperature than in the case of soft rubber, because no high-resin rubber can be used in ebonite mixings, which are thus more difficult to soften. The mixing should contain as little sulphur as possible, and a higher percentage of dust than in the case of ebonite sheet. The tube of mixing leaving the tubing machine should be directed on to a table strewn with ebonite dust, which constitutes a surface over which the unvulcanised tube readily glides. Soft rubber tube can be vulcanised in the rolled-up condition, but this is impossible with ebonite. for, after vulcanisation, the shape of the ebonite tube cannot be modified. Vulcanisation can with advantage be effected in talc. If resort is had to simple unsupported immersion in talc, the ebonite mixing must contain magnesia. for the purpose of increasing the rate of vulcanisation so that the tube attains rigidity before it experiences a tendency to collapse under the influence of the heat. The more usual, and safer, practice, however, is to insert a metal mandrel in the unvulcanised tube and then to insert in talc and vulcanise. The tube must be covered at all parts by the talc. In the case of tube of large diameter, it is good practice to place a tin plate over the talc, the reason being that the layer of talc above the tube is in such a case comparatively thin, and that the tin plate will ensure this layer becoming thoroughly soaked. With tubes of a diameter greater than 25 mm. it is advisable to vulcanise either wrapped or in the mould, as these wide tubes are very susceptible to damage during the vulcanisation. Ebonite rods can be vulcanised in steel tubes, but this is only necessary when the rods are to be of exact dimensions.

The tubes and rods are either worked-up into smaller articles or they are sold as finished products. In the latter case they are usually polished before being sent out of the works. When the tubes are being made to be used as insulators, the choice of the mixing is the most important consideration. Such a mixing must be capable of easy working on the tubing machine, and give a thin-walled article which is tough, and at the same time, flexible.

THE MANUFACTURE OF MOULDED EBONITE GOODS

Moulded ebonite goods are probably the least lucrative branch of ebonite manufacture to-day, as they have to meet the most intense competition of the synthetic resins and other ebonite substitutes. Numerous and expensive moulds, which are essential, represent the looking-up of a considerable amount of capital, so that the ebonite manufacturer must ensure every economy in the only direction that seems possible-reduction in the time of vulcanisation. The guiding principle of this branch of ebonite manufacture, is that the moulds should only be used for the preliminary stage of the vulcanisation. In other words, the articles should be kept in the moulds no longer than the time required to give them rigidity of shape. The putting into practice of this principle will naturally vary in accordance with the shape of the individual object.

Thus, there are certain articles with which it is sufficient to give a preliminary pressing in steel moulds in the cold, and then to vulcanise on cores in a current of hot air in a suitable jacketed pan. But when the article being made is so shaped that it contains many deep recesses, then it is essential to vulcanise in moulds to the very end of the process.

Moulded ebonite articles can be classified into two main groups: (1) Articles finished in fixed moulds, and (2) tinfoil pressings. A composition of antimony, tin and lead can be used as the mould metal, but pure lead is also

quite serviceable. The unvulcanised mixing is cut to suitable size and shape for the mould, inserted carefully in the mould and submitted to a preliminary pressing. The spew is cut off, the mould coated with a layer of soft soap (or collodion when a highly polished surface is wanted on the article), tightened up and vulcanised for 2½ hours. The article is then removed from the mould and the vulcanisation completed by six hours' treatment in hot air.

The procedure with tinfoil pressings (combs, rings, etc.) is as follows: The two pieces of tinfoil are first inserted in the corresponding parts of the steel matrix and pressed into place. As the tinfoil is thin, this pressing may be done by hand, but it is better practice to use a suitably-shaped template. The rubber mixing is weighed amount and corresponding in shape to the shape of the matrix, is then inserted in the lower part of this latter, care being taken to use the rubber mixing in the warm condition. The upper part of the matrix is now put into position and the whole subjected to the pressure of an elbow-lever press. These presses are of different types, some provided with foot-actuated mechanism and others hydraulically driven, according to the sizes of the objects being treated. The rubber which has been tightly packed between tinfoil by this process is then vulcanised in water for from five to eight hours. The vulcanisation may also be effected in air in a jacketed pan. In this latter case, although the vulcanisation takes longer, the danger of any green "water spots" is entirely obviated. Adequate control of the vulcanisation process by means of a recording manometer is advisable, so that the optimum conditions, once they have been determined, may be maintained. It is important to note that as the matrices are not to come into direct contact with plastic rubber, but with tinfoil, these matrices must possess no sharp contours.

The mixings which are to be used for this tinfoil pressing work, are different from those used for the ordinary moulded work. Since this class of goods is not polished the filling materials used in the mixings must be well sieved and only the best quality of ebonite dust must be used. In short, the mixings must be such that the pressings come out of the tinfoil with a surface that needs no further polishing.

The lustre is important in all classes of moulded ebonite work and must regulate the choice and quality of the materials in the mixings. Moulded ebonite articles after vulcanisation are turned on the lathe to the required dimensions and then polished with tripoli earth. Ball-or-cylindrically-shaped objects are frequently also "drummed". The main object of this last-mentioned operation is to remove the "seams",—the spewed markings corresponding to the place where the mould edges meet. After the polishing the tripoli or pumice used is removed by means of brushes. Finally, the articles are polished on rapidly-rotating flannel buffing-wheels using either linseed oil alone or linseed oil mixed with fine tripoli earth as the lubricant.

The manufacture of ebonite combs constitutes a distinct branch of ebonite technology. The material for this manufacture must possess exceptional mechanical properties, it must be tough and elastic and, above everything else, be capable of taking a high polish. The rubber employed in the mixings must, therefore, be of the very best quality and the mixing must be free from all ingredients likely to impair the quality of the combs. In the great majority of cases rubber, sulphur and a little oil are the only ingredients of a mixing for making ebonite combs. The incorporation of the mixing and the calendering into sheet are carried out in the usual way, but exceptional care must be taken to ensure the absence from the mixing of any accidental impurities.

The calendered sheet obtained may be doubled to the required thickness and vulcanised in the sheet form as in the case of the ordinary ebonite sheet to which reference has been already made. The vulcanised sheets are then sawn up into plates of the desired

size and from these plates the combs are either cut out or etched out. The more usual practice, however, is to form the unvulcanised material directly into the so-called comb plates. The material is cut into pieces of suitable shape and of a weight that has been determined by trial, placed between tinfoil and given a preliminary pressing in the foil to the shape of the comb. The moulds in which this pressing is effected are of the usual two-piece type and are constructed of iron, steel or white metal. The presses are either small hydraulic presses or elbow-lever presses. If any one size of comb is to be made in large bulk the upper and lower surface of the press daylights can act as the upper and lower moulds, the multiple mould frames fastened on the plates and the handling of the heavy moulds thus avoided. The pressed comb plates are then vulcanised by suspension in the water chest. The plates are then polished and pumiced and carried either to a comb-cutting machine or to a comb-doubling or comb-penetrating machine. The difference between these two machines is this: In the former, one comb only is cut out of the sheet, but in the latter two combs are produced at the same time, the recesses between the teeth of the first comb constituting the teeth of the second comb. Very complicated and very accurate machinery is made for both these purposes. Cut combs are superior and the cleaner in appearance, but where price is the main consideration the doubled combs possess the merit of cheapness, since much less waste is produced in their manufacture. In both cases, however, the teeth of the combs must be rounded off as well as possible, and the combs given a final pumicing and polishing treatment.

Rough ebonite pressings are used for the production of large mechanical articles. The manufacture of these articles follows the same lines as the manufacture of the moulded polishable ebonite articles, but the period of vulcanisation is shorter, and the mixing poorer in quality. Filling materials may be added to this mechanical ebonite stock until its density reaches a point from 1.8 to 2.1. The finished products comprise a large number of well-known articles such as ebonite knobs and ebonite rulers. After vulcanisation, this class of ebonite article is usually finished by rubbing over with emery and coating with oil. The special rubber compounds which are required to meet such definite specifications as resistance to fire, ability to withstand a temperature of 70° to 80 C. without softening, or resistance to acids, are also included in this class of mechanical ebonite products. They come into trade under such names as stabilite, etc., and are given practically no further treatment after they come out of the vulcanisation moulds.

It might finally be mentioned that there are a number of distinctive-shaped ebonite articles which are made in moulds but which are shaped to a certain extent after they have left the moulds. Ear syringes and pipe stems may be cited as examples of this type of article in which the final bending into shape is done under the influence of heat. The articles are warmed up in a heated steam chest and whilst warm are bent into shape and then immediately cooled by plunging into cold water. Whilst cold the article is quite hard and retains its shape, but if warmed up again becomes flexible once more. The warming-up process can be effected in hot water if wished, and in some of the smaller ebonite works the simple expedient is adopted of heating the ebonite article to be shaped over a gas or spirit flame, the operatives having learned by long experience the difficult task of securing uniformity in the heating.

THE MANUFACTURE OF ACCUMULATOR CASES AND OF EBONITE LININGS

Accumulator Cases.—The manufacture of accumulator cases seems to be the only branch of the ebonite industry which is not likely to be affected by the competition of cheap substitutes. These cases must be resistant to the action of sulphuric acid, and there are at present only three practicable construc-

tional materials, namely, lead, glass and ebonite. Lead is largely ruled out of court by its high specific gravity, whilst the brittleness of glass sets a definite limit to its applilcability. Ebonite, however, is resistant to the acid, has a specific gravity that is sufficiently low, is not fragile, is a good insulator and is to a certain degree elastic. Ebonite accumulator cases are absolutely indispensable to the electric lighting of railway trains and to the ignition in motor-cars—to mention just two instances. The World War showed the indispensability of these cases in a number of places, most of all perhaps in the matter of submarines.

The rubber mixing to be used for the manufacture of accumulator cases must be capable of withstanding completely the action of sulphuric acid of 26°Be, so that the only fillers possible are powdered glass, kieselghur, pumice-stone, barytes and atmoid. The vulcanised material must not be affected by a temperature of 50°C. and must not bulge, a condition of affairs that is determined by the choice of the right sulphur content and the correct time and temperature of vulcanisation. Two other demands are made upon the cases, namely that they should be able to withstand shocks and blows and that they should not become brittle if exposed to low temperatures.

The actual manufacture of these ebonite accmulator cases may be briefly outlined as follows: The calendered sheet of the ebonite mixing is doubled to the requisite thickness, and pieces cut out corresponding to the bottom and the side walls of the case that is to be made. The case is built up around an iron core, the core being of the size and the shape of the interior of the accumulator. The first operation is to put the bottom and the lid on the core, the two pieces of the rubber mixing being cut to accurate size in the process. Then the broader side walls of the case are put on the core and cut to size and finally the narrower side walls. The freshly-cut surfaces are brushed with a solution of Para rubber and the sides and bottom of the case pressed together. In the majority of factories the soft rubber feet, or buffers on which the accumulator case stands, are also put into place whilst the unvulcanised case is being built up on its core, but there is a growing tendency in the industry to modify this practice by attaching the rubber feet after the body of the case has been vulcanised. The reason for this modification is not far to seek. It is not easy to find a soft rubber mixing which will withstand the prolonged period of vulcanisation necessary for the ebonite without itself becoming over-vulcanised and "burned".

The core with its built-up outer case is now put into a mould constructed of iron plates. The mould is first coated with soap solution and, after the case has been put in, is screwed up and vulcanised in the horizontal pan until the case becomes sufficiently rigid to do without the support of the mould. Then the case is removed from its core, slipped on to another core, this time a hollow and light core of sheet metal, and the vulcanisation completed in talc. In some factories it is still the practice to carry out the whole of the vulcanisation on the original iron cores, but experience has shown that this is not really necessary and only interferes with the economical utilisation of the moulds possessed by the factory.

After vulcanisation the cases are pulled off their supports and their upper edges smoothed off with the buffing-wheel. As a fair amount of ebonite dust may be produced by this grinding an efficient suction device should be affixed above the wheel. The dust is sucked away as soon as it is formed and is delivered to a chamber where it is collected and afterwards sorted. Many factories are now using the sand-blast for the grinding and trueing-up of the vulcanised accumulator cases and are finding the method to be more economical and more reliable than the older method.

If the finished case on examination be found to be defective, the defect, if it is a minor one, may be remedied. If the surface of the case be marked by a number of small cavities, the fault can be made good simply by applying a coating of asphalt with a sheet-metal spatula to the cavities in question. If the cavities are at all deep they are filled with

the mixing used for making the case. A metal plate is then secured over the filled spot and heated with a benzine lamp so that the filling material becomes vulcanised in position. The final testing of the accumulator case is a very important operation, it being particularly vital to make sure that the case is tight to water. A water-pressure test was formerly largely used but has now been practically completely replaced by the use of a special apparatus. This apparatus consists of an electrical battery of adequate E.M.F. and a galvanometer. The accumulator case under test is immersed in a vessel of water which has been made slightly conducting to electricity by acidification. The case itself is fillled with non-conducting distilled water, and the electrical circuit of the battery and the galvanometer is completed except for a break between one electrode immersed in the acidulated water and one immersed in the distilled water. If there is any movement of the galvanometer pointer this may be taken as evidence of the closing of the circuit by the permeation of the acidulated water into the interior of the accumulator case, and, therefore, of the non-tightness of this latter. In addition to this the cases are tested by means of an inductance as regards their resistance to the passage of a disruptive electrical discharge at a potential of 30,000 volts.

The ebonite accessories which accompany the accumulator cases are the ebonite prisms, the separator plates, and the lid of the case. The "prisms" are the supports for the lead plates, and in the case of many of the accumulator cases that are made these prisms are a part of the bottom of the case, the corresponding recesses being provided in the top of the core on which the case is assembled. In other cases, however, the prisms are placed in specially constructed frames which are afterwards put at the bottom of the accumulator case. The frames themselves are of soft rubber, only the prisms being of ebonite. The cases are usually provided with lids which or either perforated or fitted with a screw-cap to allow the gases generated when the accumulator is being charged or discharged to escape.

The manufacture of the ebonite separator plates is a special branch of plate manufacture, but the fundamental principles and the methods employed closely resemble those for making ebonite sheet in general. The function of these separator plates is to keep apart the lead plates of the accumulator and to prevent from touching. The ebonite plates for this purposes must possess no resistance to the passage of electricity and consequently they are made perforated. It is no easy matter to find a suitable mixing which on vulcanisation will give a product that is stable against the action of the acid, elastic, flexible, and capable of standing up to the heat developed in the accumulator. The plates are made either fluted or corrugated. In the case of the latter type the actual manufacture consists in making the calendered unvulcanised ebonite sheet in the usual manner, coating it with tinfoil on both sides and then passing the tin-covered sheet through a special machine, the rollers of which are corrugated and which imparts to the sheet the corrugated effect. The sheets are then vulcanised. Fluted separator plates can be made in a number of ways, the most usual, however, being that in which the tin-covered ebonite sheet is given a pressing and preliminary vulcanisation in suitably constructed moulds and afterwards vulcanised in the open to the finished state.

In the lining or covering of metallic vessels with ebonite, one of the most important matters is to make sure that the surface of the metal to be treated is perfectly clean and dry. The vessels are usually first scoured as well as possible, heated over a fire and the surface roughened. In regard to the ebonite itself the prime requirement for a mixing that is to be applied next to the metal is that it shall adhere firmly to the metal. The first layer of the unvulcanised mixing is usually put on in the form of solution, the other layers being in the form of calendered sheet. In the majority of cases the lining or coating is made up of a number of layers, the layers being of

different qualities of material and, it is obvious, the layer which is put on last should be the most resistant. The other layers are in effect only used for the purpose of ensuring that the lining or covering does not tear away from the metal. After all the layers have been put on the vessel the vessel is allowed to stand for a time to allow any air bubbles that may have been formed to be detected and to be crushed The vessel is then well filled or surrounded with talc, vulcanised, and the talc not removed until the vessel has cooled down completely.

In recent years the lining of ships' cells (hulls?) fith ebonite has grown to the dimensions of a considerable industry, the purpose of the lining being to ensure in the event of the ship being damaged in any one place that the water shall not overflow into the other parts of the ship The sheets of ebonite for this purpose can only be applied in *situ*, and special plant and technique are necessary for the purpose. Ebonite has also found application in ship-building in another direction namely, for the coating of the propeller shaft Ebonite-coated propellers are naturally much freer from the effects of corrosion induced by the sea water than are the unprotected shafts the corrosive action in this case being electro-chemical in its nature

THE MANUFACTURE OF DUST PRESSING

To conclude this section on ebonite, brief mention should be made of the so-called "dust-Pressings", which, with the exception of the ebonite dust employed as a filler in the preparation of fresh ebonite mixings, afford the only outlet for ebonite scrap. The production of dust pressing simply consists in the use of the ebonite dust, with or without the addition of further sulphur and of such filling agents as asbestos dust, mica, rosin, pitch or oil, in the production of moulded ebonite goods. The ebonite dust for this purpose must be well sieved, and then pressed in well heated stamp presses under high pressure. The moulds employed for the production of these pressings are characterised by being constructed in two parts, the upper part projecting into the lower part. on the application of the pressure the loose dust is compacted and at the same time given the desired shape. As the dust in its uncompressed form is very voluminous as compared with the compacted form it follows that the moulds must be made much more roomy as regards their capacity for holding the original ebonite dust than the dimension of the finished article would at first seem to warrant. A large number of methods have been proposed for the efficient execution of this dust pressing operation. According to Karavodine (British Patent 12,451 of 1906) the ebonite dust is mixed with sulphur in a mould heated to a temperature of 150 to 200°C and the mixture subjectd to a pressure of from 150 to 200 atmospheres for two hours. Immisch, in British Patent 28,356 of 1907, proposes the use of ebonite shavings The shavings are cold pressed and then heated at a temperature of 137°C for a period of time corresponding to the quality of the mixing. By this heating process cohesion between the shavings is secured and the operation is completed by transferring the mass to the moulds, screwing down the moulds and heating at a temperature of 204°C By the method of Gare the ebonite dust is first subjected to very great pressure to force out the air between the particles, and is afterwards heated to 250°C. Of much greater importance in these patents of Gare are the machines he describes for the automatic production of various articles made from these ebonite pressings. But up to the present none of these processes for the utilisation of ebonite dust have met with any great degree of practical application.

SUBSTITUTES FOR EBONITE

In addition to the dust-pressings there are a large number of ebonite substitutes which contain a certain amount of rubber. Thus Vulcan-asbestos is made by adding a mixture of asbestos and sulphur to a solution of rubber in benzine, evaporating the solvent and vulcanising the mass obtained in moulds, in

talc, or in open steam. Ebonite substitutes can be classified into two main groups depending on the materials from which they are made. In the first group we have those composed of mixtures of different materials and in the second group we have the synthetic resins and similar chemically-produced proproducts. In the first group the products comprised are largely used as electrical insulating and are usually made by incorporating an insulating material, which by itself incapable of being worked or moulded, with a binding material, the resultant mixture being workable. Thus, Ambroin simply consists of asbestos that has been soaked in a solution of copal. When the mass is dry it is as hard as stone, and can be ground up and moulded into any desired shape. Tenacit and Kronite are similar materials. Instead of a resin, pitch, tar or asphalt can be used as the binding material and even silicate of soda, the last-mentioned substance having the further advantage that it is fire-proof, although it has the drawback of hygroscopicity. Esbenit, Bitit and Fibron are examples of this type of composition, the first mentioned of these three being made from a mixture of cellulose, asbestos dust, magnesium oxide, and calcium oxide and being employed for making accumulator cases. The compositions which are to be used for electrical insulating purposes must be non-hygroscopic and must possess a certain degree of mechanical strength. One of the best of these substitutes, and one that has replaced ebonite in a good many of its applications, is Vulcan Fibre, made by the action of zinc chloride on thin unsized paper and which comes into trade in two qualities, a hard material and a flexible material.

In regard to the second class of ebonite substitute to which we have referred above, in addition to galalith—a product made from casein,—the so-called synthetic resins or phenol-formaldehyde condensation products are the most important.

Of these materials the best-known are bakelite, resinite, kondensite and juvenite, and their most pronounced property is the rapidity with which they are transformed from the soft to the hard modification. The first product of the condensation of phenol and formaldehyde, or bakelite A, is either syrupy or solid, but in any case is readily soluble and fusible. On further heating it is converted into bakelite B, which is infusible and much less soluble than the A modification, but which none the less does soften and become to some extent distorted at high temperatures. On still further heating bakelite C, which is neither soluble for fusible and which will withstand a temperature of 360°C. is produced. A disadvantage of this material is its brittleness, but this drawback can be minimised by the incorporation of suitable filling materials. Its chief competition with ebonite is in the production of such utility articles as knobs. As an insulating material bakelite has not met with the success that had been anticipated for it. The trouble is that its behaviour in this respect is rather erratic, batches of the material being occasionally found to be distinctly conducting towards electricity.

Canning and Preserving Fish

CANNED FISH

Only fresh fish should be canned. They should be killed and bled as soon as caught. The scales are more easily removed if the fish are ripped for a moment into boiling water. If the skin is tough the fish should be skinned. The viscera and all dark membrane found in the abdominal cavity are carefully removed. In canning small fish the backbone is left in. If the fish are large it is removed. The dressed fish are placed in a brine (1 ounce salt per quart of water) in order to draw out all blood before packing. This requires 10 minutes to 1 hour, depending upon size of fish. The brine should be in sufficient quantity to cover the fish and should not be used more than one lot of fish. If the meat is loose or soft it can be hardened by allowing it to soak in a 40 Salometer brine (4 ounces salt per quart of water). The time required will vary, according to size of fish. from a few minutes to one hour

The fish are removed from the brine and drained well. They are cut into convenient size pieces for packing. The pieces are packed closely to within one-quarter inch of the top of container. A teaspoonful of salt is added to each No. 2 can or pint jar. The tin cans are exhausted under 10 pounds pressure for 10 minutes and sealed while hot. Glass jars are partially sealed.

Fish should be processed under 15 pounds pressure at a temperature of 250°F., No. 2 cans and pint jars 80 minutes.

SALT FISH

Large fish having soft fins, small scales and thin skin should be scaled, not skinned. The head is removed and the fish is split down the belly to the vent in order to remove the viscera. A cut is made on each side of the backbone inside the body cavity. The bone is cut off at the extreme back of the cavity and the cut off portion is removed. Another cut is made along one side of the backbone for the remaining length of the fish and the tail is cut off. If the fish are too large to go into the container they should be cut into the proper length.

Slender fish such as mackerel, large herring, etc., are cut down one side of the backbone for the entire length after removing the head. The viscera are removed through the split along the back. Coarse-scaled, thick-skinned, spiny-finned fish, like black bass, perch, etc., are skinned. Small fish may be eviscerated without splitting them.

The prepared fish are carefully washed in water containing a small amount of salt (1 cup per gallon of water) until thoroughly clean. They are then cured as follows: —

A thin layer of salt is first placed over the bottom of the barrel or keg. On this is spread a layer of fish, one deep, a rather thick layer of salt is sprinkled over the fish. Another layer of fish and salt as above is added and so on until the barrel is filled or until the supply of fish is used up. Approximately 35 pounds of salt per barrel of fish will be required. The salt and the moisture from the fish will make a strong brine in which the fish should remain for a week or 10 days. At the end of that period the fish are removed from the barrel and washed in clean water. The brine is discarded, the fish are repacked in the cleaned barrel and are covered with a fresh brine made by dissolving 1 pound of salt in each gallon of water. After 1 week this brine is drawn off and discarded and the barrel is filled with a saturated brine, that is, salt sufficient so that a small amount remains undissolved in the water after prolonged stirring.

(Approximately 2½ pounds of salt per gallon of water will be required to produce a saturated solution). The barrel may then be headed up, or a false head is fitted inside and a weight is added to keep the fish submerged. At no time during storage should the brine be allowed to fall below the false head. The fish should be stored in a cool cellar.

OYSTERS

Only fresh oysters should be canned. It is therefore advisable to open oysters by hand. All oysters with partly open shell should be rejected. The shelled oysters are rinsed in clear water. Care must be given to avoid including small pieces of shell. The oyster meat is packed into lacquered tin cans or glass jars—16 ounces in No. 2 tin can and 14 ounces in a pint jar. Hot brine (¼ pound to 5 quarts of water) is added to fill to within ¼ inch of the top. Tin cans are exhausted and sealed, glass jars are partially sealed; and either container is processed, No. 2 tin cans and pint jars 40 minutes at 240°F., or 10 pounds steam pressure.

CLAMS

Clams are canned in the same manner as oysters. If clams are muddy they should be given a thorough washing before they are opened. All broken or discoloured clams should be discarded.

The clams should be thoroughly washed before they are opened. The clam meat together with their liquid are placed in a vessel and cold water is added to just cover the clams. They are then set over the fire and boiled slowly for 10 minutes. The broth is strained off through a layer of good cheesecloth. The broth is returned to the saucepan and seasoned to taste with salt and pepper. One tablespoonful of butter for each 50 large clams is added. The broth is heated to simmer and filled into lacquered tin cans or glass jars. The tin cans are sealed while hot. The glass jars are partially sealed. The broth is processed, No. 2 tin cans and pint glass jars 40 minutes at 250°F., or 15 pounds pressure

CLAM CHOWDER

There are many methods of making a good clam chowder. The inexperienced canner may use the following recipe as a guide for manufacturing and preserving this delicious food.

For each 2 dozen large clams the following materials are required: 2 quarts hot water, 2 medium white onions, 2 branches of celery, 2 leeks, 2 slices of bacon-cut into dice, a large potatoes, peeled and cut into dice, 1 to 2 teaspoonfuls salt, ¼ teaspoonful pepper. 3 large tomatoes, 1 teaspoonful finely cut parsley.

The clams, onions, celery and leeks are all chopped. Size of pieces may be according to taste but are usually quite fine, the tomatoes are boiled in their own juice for 5 to 10 minutes, then rubbed through a fine sieve to remove skins and seeds.

The bacon is heated and the onions, celery and leeks are fried in the fat, the juice drained from the clams, the water and potatoes are added and boiled for 10 minutes. The remaining materials, except the parsley, are then added and the mixture is again boiled slowly for 10 minutes. The parsely is added and the hot chowder is filled into No. 2 cans or pint jars. The cans are sealed while hot, the glass jars are partially sealed. The chowder is then processed, No. 2 cans and pint jars 40 minutes at 250°F., or 15 pounds steam pressure.

CANNED SHRIMP

Shrimp should be used only when absolutely fresh, as they deteriorate very quickly. They may be peeled or the shell may be left on until after they are cooked. In either event they are boiled in salt water, 1 pound of salt to 1 gallon of water. The shrimp should not be placed in the water until it is boiling. They are boiled 5 to 6 minutes. If they were not peeled before boiling they are drained well and sprinkled with a small amount of salt. The salt will harden the meat somewhat

and the shrimp may the more easily be peeled. Shrimp should be packed into enamelled tin cans or glass jars.

Wet Pack.—The prepared shrimp meat is packed into lacquered tin cans or small glass jars. The container is filled with a weak hot brine (1 tablespoonful salt per quart water) to within one-quarter inch of the top. Tin cans are exhausted for 5 to 10 minutes and sealed while hot, glass jars are partially sealed and processed, No. 1 tin cans and tall, narrow half-pint jars 15 minutes at 240°F., or 10 pounds pressure, No. 2 tin cans and pint jars or flat half-pint jars 30 minutes at 240°F., or 10 pounds pressure.

Dry Pack.—The prepared shrimp meat is packed into the containers, no liquid is added. Tin cans are exhausted 10 minutes and sealed while hot, glass jars are partially sealed. No. 1 tin cans and tall half-pint jars are processed 60 minutes at 240°F., or 10 pounds pressure; No. 2 tin cans and pint jars—90 minutes at 240°F., or 10 pound pressure.

CRAB MEAT

Crabs are most easily handled in the following manner. Baking soda is added to boiling water at the rate of ¾ ounce per gallon of water. The live crabs are dropped into this boiling solution and boiled for 20 minutes. They are removed from the hot water and thoroughly washed in clear, cold water. All available meat is picked from the shell. Care must be taken to exclude small bits of the shell. The meat is washed in a weak brine (1 tablespoonful of salt per quart of water) it is drained well and packed moderately close in lacquered tin cans. The cans are exhausted for 10 minutes and sealed while hot; No. 1 tin cans are processed for 45 minutes at 250°F., or 15 pounds steam pressure. The cans must be cooled very quickly after processing in order to prevent discolouring the meat. Glass jars are not as well adapted to canning crab meat because of difficulty in rapid cooling after processing.

Coatings of Noble and Rare Metals

SILVER COATINGS

The commercial application of the electrodeposition of silver dates from about 1840. Cyanide solutions are used almost exclusively in the silver-plating industry. These solutions possess many advantages, such as high anode and cathode efficiencies and good plating characteristics over a wide range of solution composition, temperature and current density. The silver cyanide bath is prepared by dissolving silver cyanide in potassium or sodium cyanide, forming thereby a double cyanide In recent years the sodium salt has come to be largely used for this purpose although the potassium compound is preferable, as it possesses a high conductivity and a wider plating range in terms of current density. The plate from the potassium solution is said to be superior in physical appearance and may be burnished more satisfactorily than that from sodium cyanide. Owing to the poisonous nature of cyanide solutions many attempts have been made to deposit silver from solutions of other silver salts such as the sulphate, nitrate, fluoride and fluoborate, but the results have been unpromising. Recently, however, deposits have been obtained from acid complex iodide baths which are said to

be equivalent in quality to those obtainable from cyanide baths.

Silver deposits from cyanide solutions have a milky or frosted appearance and may require buffing to secure a bright surface. To overcome this difficulty it has long been customary to add to the plating bath small proportions of carbon disulphide as a brightening agent. More recently it has been shown that the addition of about 1 gram of sodium thiosulphate and 10 c.c. of ammonia per liter of plating solution is more effective than is carbon disulphide in producing a bright white silver deposit.

Numerous variations may be necessary in the preliminary treatment of metals to be plated, such "strikes" and "dips" in various solutions before immersion in the plating bath. Most metals tend to precipitate silver from solution by simple immersion, and this tendency is minimized by "striking" the basis metal at high current densities in solutions of low metallic ion concentrations—usually dilute cyanide solutions. Another method of reducing immersion plating and securing deposits of improved adherence is to flash the metal to be plated with a thin layer of a metallic deposit which shows a lesser tendeny to replace silver from solution. There appears to be some advantage in a preliminary copper strike followed by a silver strike in the silver plating of steel surfaces. By this means adherent smooth deposits 0.05 to 0.07 in. in thickness may be obtained.

THICKNESS OF SILVER PLATING

It was formerly the custom in describing silver-plated ware to use such designations as "triple-plated", "quadruple-plated", and the like. The use of these misleading terms has now been discontinued by American manufacturers and the weight of silver, for example, per unit of surface area as on a stated number of articles of similar kind and size, is used instead to indicate the thickness of the coating. The table given below shows the average thickness of the coating on silver-plated tableware as adoped under the NRA and since generally accepted. The Federal Specification Board specifies for all pieces an average thickness of silver of 0.00125 in. This corresponds to 1 troy ounce per square foot. For overlay 0.0018 in. is specified.

AVERAGE WEIGHT OF COATING ON SILVER-PLATED TABLEWARE

	Teaspoon (Oz. Silver Per Gross).	Dessert Spoon Dessert Fork R. B. Soup Spoon (Oz. Silver Per Gross).	Tablespoon Dinner Fork (Oz. Silver Per Gross.
"AI" or Standard"	2	3	4
"AA"	3	4½	6
"Double' or "X"	4	6	8
"Triple" or "XXX"	6	9	12
"Quadruple" or "XXXX"	8	12	16

It is also necessary to take into account the thickness of the coating on those portions of plated tableware which are subjected to the greatest wear, such as the back of the bowl of spoons or the tines of forks. It is common practice, for the better grade of tableware, to use a heavier coating on such portions. This is obtained either by use of a silver insert in the "blank", which is later plated, or by a supplementary plating of the desired portions after the article has been given the regular plating. The specification referred to above requires the silver coating to be 0.0012 inch thick on such spots.

DEFECTS IN SILVER COATINGS

The occurrence of red stains on silver-plated article is sometimes the cause of considerable concern to silver platers. This defect has been shown to arise during the polishing operation; it appears to be related to improper use of the polishing rouge on a surface while still heated by the polishing operation.

"Spotting out" on silver-plated surfaces is another defect. These white spots, which do not appear until some time after the article has been removed from the plating bath, are to be ascribed primarily to inclusion of some of

the cyanide in the coating. The exact nature of the defect, however, has not been fully established.

At times difficulty is experienced in polishing silver coatings. The coating in such cases often has a coarse crystalline appearance which is removed with difficulty by ordinary polishing methods. It has been reported that silver may be electrodeposited under certain conditions so that the crystals of the silver form as extensions of the pre-existing crystals of the nickel-silver base metal. Such coarsely grained silver coatings cannot be satisfactorily polished by the methods usually employed. It has not been established, however, that this is the only cause for irregularities in the polishing of silver-plated coatings.

TARNISHING OF SILVER

Silver readily tarnishes upon exposure to industrial atmospheres or indoor air contaminated by the products of combustion of sulphur-bearing fuels. Foods such as onions and eggs, which contain organic sulphur compounds, are also well known to tarnish silver.

The tarnish film which forms on silver exposed to the air is composed of silver sulphide and contains no oxide. Even when silver which has been previously oxidized is exposed to the air the film becomes converted into sulphide. The gain in weight of silver with time of exposure to the atmosphere is parabolic in type. This suggests that the process is controlled by diffusion. It has been proposed recently that the tarnishing process is electrolytic in character and that the rate of tarnishing of silver is probably controlled by the mobility of silver ions, which is unusually high. The rate of tarnish does not appear to be appreciably influenced by the variation in humidity prevailing indoors throughout the year. Unlike the behaviour of many of the base metals, there does not appear to be in the case of silver a critical relative humidity above which the rate of corrosion is abruptly and markedly accelerated.

In appearance tarnish films on silver exhibit the usual range of interference colours. There seems to be little relationship between the appearance of tarnished silver and its electrical contact resistance.

The removal of the tarnish film on silverware may be accomplished by polishing the surface with a fine abrasive or by electrolysis. If, in a solution of sodium chloride and sodium carbonate, both of which are common household materials, a tarnished silver article is placed in contact with a metal, such as zinc or aluminium, it will be detarnished. The base metal serves as anode, the silver as cathode, and by means of cathodic action the silver sulphide is reduced to silver. Silver knives with stainless steel blades should not be subjected to this treatment. There is no appreciable loss of silver in the reduction process. If the silver has been very severely tarnished, the surface after cleaning is dull on account of the thin film of "moss" silver formed by reduction of the sulphide. Buffing may be necessary in such cases to restore the polish.

Attempts have been made to improve the the tarnish resistance of silver by the codeposition of another metal. Silver-cadmium alloys were proposed for this purpose but it was found that alloys containing 3 per cent or more of cadmium possess an undesirable yellowish tinge. An electrodeposited silver-cadmium alloy containing about 24 per cent of silver has been recommended for its light-reflecting properties inasmuch as it maintains its reflecting power to a greater degree than does silver when both are tarnished. Alloys of silver with indium may be plated and are claimed to possess superior resistance to tarnish. Silver-lead are said to tarnish more readily than silver alone. A recent extensive study of the tarnishing of silver and silver alloys indicates that the most feasible method of preventing tarnish is to provide a surface film of high electrical resistance. This is most successfully accomplished either by the selective oxidation of aluminium or beryllium in silver alloys or by the superimposition of cathodically deposited films of these oxides on pure silver or its alloys.

GOLD COATING

Gold coatings are applied by electroplating and by gold-filling. Because of the highly electropositive or noble character of gold, coatings of this metal do not afford any electrochemical protection to base metals. The resistance of gold to chemical attack and tarnish makes it a particularly desirable metal to use in highly corrosive environments provided the coating is substantially porefree. Gold coatings are widely used for certain types of electrical contacts.

Gold electroplating solutions usually consist essentially of the double cyanide of gold and potassium. Sodium cyanide may be employed in place of the potassium salt and in some cases a small percentage of sodium phosphate is added to the solution. Gold baths are operated in the temperature range 45° to 80 C. (113° to 1768F.) and at current densities from 0.1 to 0.5 ampere per sq. dm. (1.0 to 5.0 amperes per sq. ft.). By varying the composition of the plating solution, that is, by adding other metals such as silver, copper and nickel, coatings of green, red and white colours may be obtained. These deposits are in reality alloys of gold and the other metal.

Gold can also be plated without the application of an electromotive force external to the plating cell. One such method merely requires setting up a primary battery which uses two solutions; one of them, the gold solution, is kept separate from the second one, sodium chloride, by means of a porous cup. A strip of zinc, the anode of the cell, is immersed in the sodium chloride solution; the article to be plated, either brass or copper, is hung in the gold solution within the porous cup. Electrical contact by means of a wire is made between the two electrodes, that is, the zinc strip and article to be plated. In such a cell, gold from the solution deposits upon the surface of the cathode (article to be plated) when a current is allowed to flow by connecting the anode and cathode by a wire. The deposit is very uniform and adherent. A much simpler method merely requires immersion of the article, brass or copper, in a gold solution of the proper composition. In this case, the article is plated by the passage of a slight amount of copper or zinc into solution and the precipitation of an equivalent amount of gold on the surface. The coating obtained is very adherent but exceedingly thin and the method is used only for small, cheap articles. Such coatings are only a few millionths of an inch in thickness.

Electroplated gold coatings are fine-grained and dense in structure. It is possible to deposit gold coatings on brass in thicknesses of the order of 0.0001 inch which show no evidence of pinhole corrosion in the usual accelerated corrosion tests. Generally for contact surfaces, deposits of 0.0005 inch are recommended. The use of nickel as an undercoating for gold has been recommended for the protection of steel.

Gold filled" articles, such as watch cases, are stamped from gold-plated sheet made by soldering a sheet of gold or gold alloy to a slab of nickelsilver or brass. The soldering is accomplished by inserting a thin sheet of "brazing" alloy between the gold and the basis metal. It is necessary to heat the material only above the melting point of the braze which is considerably lower than that of either the gold or the basis metal.

According to the U.S. Federal Trade Commission relating to the gold-filled watch-case industry, the minimum thickness of the gold layer on such gold-filled plate must be 0.003 inch on the outside of the case and 0.001 on the inside.

By the use of proper reducing solutions gold and silver can be reduced to the metallic form from their solutions, and coatings obtained directly by this means. This method is used principally for the production of mirrors, however, rather than for coating other metals.

RHODIUM COATINGS

Rhodium may be electrodeposited as a bright pinkish-white coating which is not tarnished appreciably in the air and which is

not dissolved even in hot aqua regia. It has come into commercial use in the jewellery reflector industries where tarnish resistance and high reflectivity are attractive attributes. In the manufacture of reflectors for search-lights rhodium is deposited on undercoatings of electrodeposited copper. There is some doubt as to the suitability of rhodium coatings for the protection of silver tableware from tarnish. For one thing rhodium differs slightly from silver in appearance. While rhodium is somewhat harder than silver, it may be expected to be scratched and otherwise damaged by the usage to which tableware is subjected, with the result that the rhodium coating will be removed in places, permitting the underlying silver to tarnish and darken It is reported that rhodium-plated silver contacts have been used successfully in telephone apparatus.

Rhodium may be plated from a sulphate bath containing ammonium sulphate operating at about 50°C (122°F.) and at current densities not to exceed 9 amperes per sq. dm. (0.6 ampere per sq. in.). Very satisfactory deposits may be obtained also from a solution of ammonium rhodinitrite.

Rhodium coatings are generally of the order of 0.00001 inch in thickness. Attemps to produce appreciably heavier coatings have not been successful.

PLATINUM AND PALLADIUM COATINGS

Platinum and palladium coatings have been used, like gold, to a limited extent for protective coatings and for electrical contacts. Platinum has been electroplated for many years, usually from a complex phosphate bath. More recently it has been shown that both platinum and palladium may be more satisfactorily deposited from amminonitrate solutions. These baths are used at 90-95°C. (194-203°F.). The throwing power of the solutions is good enough to permit satisfactory covering of all recessed areas of jewellery parts. The coatings are bright and do not require buffing. A non-porous deposit of palladium requires a coating 0.0002 inch in thickness. Coatings of the platinum metals notably palladium, may be fabricated by mechanical methods. This may be accomplished by welding layers of the noble metal on nickel strip and rolling down to the desired dimensions.

INDIUM COATINGS

Indium is one of the rarer elements. It usually occurs in small amounts with certain zinc ores from which it is recovered by chemical and electro-chemical methods. Indium is very soft, ductile metal of a gray, lustrous appearance. It melts at 115°C. The metal is now available in commercial quantities.

Although indium was electrodeposited as long ago as 1904, it was only recently that a practical plating process was developed. The plating bath is prepared by dissolving precipitated indium hydroxide in a concentrated sodium cyanide solution and adding 0.5 gram of glucose for each gram of indium present. The bath is operated at room temperature at current densities from 1 to 16 amperes per square decimeter.

Indium electrodeposits are silver-white in colour and of a satin-like texture Indium remains bright in the air and is more resistant to tarnish than is silver. The coating is soft and may be scratched with the fingernail. As mentioned previously in the discussion of tarnish-resistant silver alloys, it is possible to electrodeposit alloys of indium with silver. These alloys are harder than either of the two metals alone.

RHENIUM COATINGS

Rhenium is a rare metal rather widely distributed in small amounts in certain molybdenum and platinum ores. Rhenium has been successfully electrodeposited, but so far as is known it has not been used commercially. It may be codeposited with cobalt and nickel. Rhenium coatings are mirror bright if plated on polished surfaces Perhaps the most distinctive feature of rhenium coatings is a high resistance to hydrochloric acid solutions.

Reclaiming Scrap Rubber

The various types of scrap to be reclaimed and also the type of product to be made will determine which of several methods shall be used as the manufacturing process. These processes may be enumerated as:

1. The alkali digestion process.
2. The water digestion process.
3. The acid process.
4. The open steam process.
5. The mechanical process.

The alkali digestion process will be discussed, whereas in the remaining processes the important operations will be only briefly described.

THE ALKALI DIGESTION PROCESS

The method commonly used in the reclaiming of rubber is known as the alkali process. This process was patented in 1899 and derives its name from the fact that the fabric is removed from fabric bearing scrap, chiefly whole tyre scrap, by means of caustic soda.

The scrap tyres are received from the brokers in box cars and occasionally by truck. Beads are removed from the scrap tyres by debeading machines of which there are several types. The debeaded tyre is then ground by passing it through cracker rolls and past rapidly rotating knives in order to comminute the scrap so that it will be in a condition suitable for digestion under pressure with caustic soda. The degree of fineness to which the scrap is ground influences to a large extent the thoroughness of the subsequent heating and plasticizing operation, since a uniformly ground and finer scrap will offer a much greater surface per unit weight. After the scrap is ground, it is passed over magnetic separators which remove a large percentage of the magnetic metal, such as steel.

The next step is the treatment of the scrap in autoclaves. These machines are steam-jacketed vessels equipped with stirring devices and having a capacity of 2 to 4 tons of ground tyre scrap. In the digestion, solutions of caustic soda of from 4 to 8% strength are used together with oils or swelling agents as required. The strength of the caustic soda solution is determined by the temperature, pressure and duration of the heat treatment.

Different oils and swelling agents have specific effects on the final product and are chosen for these results. Generally speaking, a neutral oil used at this point gives a flatter and less nervy final products, whereas a saponifiable oil makes the product seem to have more body and nerve. This effect is due to the soap formed during the digestion. The pressures used may vary from 160 to 200 lb. per sq. in., and the time from 8 to 24 hours. The longer times are used for bus or giant tyres which are in general less aged and consequently tougher and require a more drastic treatment.

After the digestion, or "devulcanization" as it is incorrectly called, is completed, the scrap is blown under pressure into wash tanks and thence over de-watering screens in which process it is washed free of residual caustic and dirt. A considerable amount of fine partially hydrolyzed cellulose passes through the dewatering screens. This material is thickened continually and thereafter filtered on a rotating drum filter. After its recovery, it may be dried and used in special products. The digested and washed scrap is then passed through a squeezing press to remove as much water as possible before it is dried. It is necessary to control the washing and de-watering operations in order to remove all foreign material and also to keep a uniform residual alkanity. The effect of this alkanity will be discussed later.

The digesting operation is intermittent, a considerable quantity of material being dis-

charged at one time, and it has been found necessary to have storage bins from which the digested and washed scrap is fed manually into the dryers. Automatic feeders have not been particularly successful. The dryers in common use are belt dryers utilizing temperatures of from 200° to 250°F. Depending upon its type, the scrap is usually dried to a moisture content of 3 to 5%

The finishing operation in the reclaiming of rubber is one requiring careful attention The dried scrap is first milled either on an open roll mill or in an internal mixer for the purpose of further plasticizing. During this operation, it is sometimes desirable to add certain ingredients to give the reclaimed rubber specific properties. After the milling operation, the massed slabs are given a first pass through a refiner. A refiner is similar to a two-roll mill, the rolls usually being 30 to 36 inches long and capable of being squeezed together with enormous pressure in order to compress the particles of rubber into a very fine sheet. In order to produce a uniform sheet the refiner rolls have crowns correctly determined by test and continually kept to specification. The roll surface temperature should be between 180° and 210°F. for best results of quality and production.

During the first refining operation, this sheet may have a thickness of .010 in., and in the final operation, it may be from .002 to .005 in. The refining operation derives its name from the fact that any hard, unsoftened pieces of scrap are left behind in the "bite" of the rolls or are passed out at the edges of the rolls, the unrefined pieces being called "tailings". These "tailings" are quite dry and hard and must be re-worked through the devulcanization process.

After the first refining, the scrap is usually in condition to be strained; that is, it is put into a machine equipped with a barrel and screw, similar to a tubing machine, which forces the scrap through a fine screen to remove the non-magnetic metals such as brass and copper and the last traces of the steel. These screens generally have openings of from .015 to .25 in.

The final refining operation is then performed, giving a thin uniform sheet of rubber which is wound on a rotating drum to a given thickness, after which it may be cut to form a square flat slab. These slabs are dusted with powder to prevent them from adhering.

Occasionally after the last refining operation the slabs are passed through a sheeting mill purely for the purpose of blending and putting them in condition for shipment The objection to this procedure is that it covers up any roughness which may have been present in the original slabs, whereas the slabs direct from the refiner are very easily inspected.

THE WATER DIGESTION PROCESS

In the processing of scrap which does not contain fabric, such for example as airbags, the same process may be applied as outlined above except that caustic soda is not used and the washing process may be minimized.

THE ACID PROCESS

In order to impart certain qualities of inertness and dryness to whole tyre scrap and boot and shoe scrap, it may be subjected to what is commonly known as the "double process" or "acid process". Two separate operations are involved for the removal of fibre and the plasticization. The scrap is prepared as usual but is first digested in sulphuric or hydrochloric acid for the purpose of removing the cellulose. This operation is carried out at low temperatures in open tanks and after digestion, the acid is removed by washing and neutralization, followed by further washing and riffling.

In riffling, the scrap plus wash water passes through a long trough equipped with cross pieces or riffles which hold back the dirt and metal during the passage of the scrap down the trough. This whole operating of washing and riffling also removes the water-soluble materials, thereby giving a product which offers greater resistance to water absorption.

If desired, the defiberized scrap may be ground and further washed. It is then dried and treated by the pan or open steam process described below. Occasionally the plasticized scrap is further washed to remove any soluble soaps formed during the steam treatment. The finishing, straining and refining operations are carried out in the same manner as described for the alkali digestion process.

THE OPEN STEAM PROCESS

The open steam (or pan) process is used chiefly on inner tubes and acid-treated fabric scrap. In this process, the scrap is commonly ground to about pea size or finer, after which it is mixed with caustic, swelling agents or oils, as desired. This mixing is carried out in an open internal mixer, the scrap then being placed in containers such as open pans four to six in. deep. These pans are stacked on cars which are rolled into a cylindrical, horizontal heater into which live steam may be passed. The material is subjected to this live steam treatment at pressures from 100 to 175 lb. for varying periods of time. After the treatment is finished, the "biscuits" as they are called, are removed, dried, and are then ready for the mill room operations as described above.

THE MECHANICAL PROCESS

A great deal of scrap is partially reclaimed by what may be called a "mechanical process" namely, grinding the scrap without previous heating. Many plants carry out this operation in order to utilize their overflow and defective production. The operations consist only in grinding, screening and cooling, the size of the ground particles being determined by the particular requirements. The product thus obtained is used as a filler. It has a low specific gravity, assists moulding, and cuts down shrinkage.

RECLAIMED RUBBER IN TYRES

The use of reclaim in first-grade carcass stocks for passenger cars tyres is generally considered when crude rubber prices are on a rising market. One compound incorporating reclaim, consists of the following: 85 lb. smoked sheets, 30 lb. high zinc oxide truck tyre reclaim, 13.5 lb. whiting (fine particle size, such as Calcene), 0.5 lb. stearic acid, 1.5 lb. palm oil, 0.3 lb. Accelerator 808, 3 lb. sulphur, and 1 lb. Neozone D. 45 minutes of optimum press cure at 274°F. for a thin sheet is used. The stock is suitable for the carcass of first-line passenger car tyres.

Products Containing Chlorophyll

Chlorophyll is the substance which makes plants green. It was so named in 1817 by French chemists, who combined the Greek chloros, green, and phyllon, leaf. They were pursuing a line previously thought out by Sir Joseph Priestley.

Priestley was the Englishman who discovered oxygen. He also invented soda water. He was a cantankerous sort of fellow and after some high words with the English Government he went to Pennsylvania. In pursuing his studies, he had occasion to consider the processes of plant life. He inverted a bell glass over a pan of water and lit a candle inside it which exhausted the oxygen in burning. Reminding himself that plants and animals both need air, he put a sprig of mint inside the bell, where he left it for some time. It throve, and he found that he could again light a candle inside the jar and that a mouse placed therein suffered no inconvenience.

Priestley concluded that what happened was that plant life worked the opposite of animal life—that plants consumed carbon dioxide and gave off oxygen—which is indeed the way it happens. He also figured that the agents involved in this exchange were sunlight and the "green matter" in the plants to provide the process now known as photosynthesis (a putting together by light). Thus, he reasoned, when darkness falls, the process is reversed.

This accounts for the fact that in most hospitals, nurses take the flowers out of rooms at night, in the belief that the plants, giving off beneficial oxygen by day, are exuding poisonous carbon dioxide by night and might harm the patients. The theory is correct, but the small amounts of either gas would have no effect on patients.

Many chemists for generations have been slightly obsessed about chlorophyll. They tried to extract it from plants, they tried to make it synthetically, they tried to find out what it actually does. They have succeeded in the first of these tasks. The others remain more or less unbeatable.

WHAT IT DOES

This much is known: Chlorophyll is to vegetable life what hemoglobin is to animal life. It carries and converts into energy the food for the whole organism.

Like the red part of the blood it can change ingested material into substances that support life such as carbohydrates. In plants, chlorophyll apparently converts water into food. The molecular structure of chlorophyll is quite similar to that of hemoglobin. The only big difference between the symbol for chlorophyll and that for hemoglobin is the Mg., magnesium. The similarity has led a lot of investigators to turn toward chlorophyll as a remedy for anemia. Dr. Emil Buergi of Switzerland was the first to work along these lines. It happens that chlorophyll in its natural state is oil-soluble and thus not acceptable in the human system. A process was developed by which it was made water-soluble, and this permitted Buergi's experiments. He held that it changed to hemoglobin in the body and thus stimulated the appetite and the blood-building organs.

He further noted that it seemed to stimulate the growth of tissues around wounds, ulcers and burns. Other scientists followed the line he laid out. The late Dr. Benjamin Gruskin of Philadelphia, U.S.A., really brought the use of chlorophyll to the fore in the treatment of wounds, burns, skin ailments and the like and noted another fact that became very important to present-day use of the substance.

This was that when chlorophyll was applied to the site of the lesion in ointment or in wet

pack the offensive odours that often go along with these things disappeared. This was less important to the doctors than the therapeutic effect of the chlorophyll, so nobody paid much attention to it at the time (about 1938) except to remark their pleasant surprise at the vanishing of the smells.

The present upsurge in the career of chlorophyll can be traced to Dr. F. Howard Westcott of New York City. Dr. Westcott was working with degenerative diseases cancer, osteomyelitis and the like. He was actually in search of something that would help to build up his patients and was attempting a projection of Buerg's studies on chlorophyll in anemia. It didn't do anything much for anemia, but there was a starting clearing of the air, which made things much more pleasant for the sufferer, room-mates, doctors and nurses.

Osteomyelitis, for example, produces an extremely unpleasant smell. Patients given the chlorophyll preparation didn't get over their disease, but life became more bearable.

Westcott, remembering Gruskin's findings about the deodorizing properties of chlorophyll, thought there might be something in it as a general deodorant. He started in 1941 with a series of animal test which showed that anyway it couldn't harm anybody. He proceeded to human experiment, using people in various walks of life—heavy and light workers—and recording the results with an osmoscope, which measure the strength of smell.

There have been, of course, many other preparations sold as deodorants. A lot of them have a simple aluminium sulphate base, either in solution or in a cream, with a slight perfume added. This material suppresses persopiration in the areas where it is most profuse, notably the underarm. Perspiration odor is caused by the decomposition of the excretion of the sweat glands. If the glands don't produce they don't create an odor. This is all right unless you have a sensitive skin which is irritated by such preparations. Lots of people find them entirely satisfactory, however.

It is a peculiarity of body odors that you don't notice your own. By faithful external applications of these deodorants you can be fairly sure that you are not "offending". But chlorophyll preparations are supposed to work internally, eliminating, in some way that no one—so far—has been able to explain, the odor before it occurs.

There are now no less than 29 tablets, lozenges of pills that can be taken by mouth to prevent body odors. There are at least six chewing gums and four mouthwashes, a couple of stick deodorants, a shampoo, a soap, a cigarette and nine different dog foods that contain chlorophyll in varying degrees.

In dog foods, chlorophyll can make a smelly animal a pleasure to have around the house, and there's no denying that some breeds of dogs, though lovable, are pretty gamy. The amount of chlorophyll contained in most dog foods is sufficient to deodorize the animal under ordinary circumstances. However, there is not enough to interfere with the seasonal odor in bitches, and an additional dose of standard chlorophyll would be necessary to eliminate this.

Incidentally, chlorophyll has absolutely no effect on the breeding capacities of either sex, though this has been rumoured.

Dehydrated alfalfa purchased from farmers is shipped to the plant where chlorophyll is produced. Most alfalfa fields in the U.S.A. yield five cuts. Alfalfa contains most chlorophyll in Spring and Fall, at which times the plant's system compensates by increasing chlorophyll to make the best of the weaker sun.

Alfalfa is almost the sole source of commercial chlorophyll. After the factory has extracted what it wants, the residue is still useful as fodder; since the essential proteins remain in it. Manufacturers are using more and more chlorophyll every day, as the public becomes more conscious of green.

There was even a shortage for a while last year when the Midwest floods washed out the crop in the Missouri basin in the U.S.A.

NEW DEVELOPMENTS

Somebody keeps thinking up new things to put chlorophyll into, such as a scented candle or a reducing pill. About to be produced is an aerosol bomb for room deodorizing thus far not suite possible with chlorophyll. Chlorophyll must come in contact with all the air of a room to be effective. There are ways of deodorizing, of course, such as with Airwick. This contains chlorophyll, but the efficiency of Airwick is not solely due to its presence. Other dependants use fan overlying sweet scent which cancels out the objectionable smell. An aerosol bomb of chlorophyll would permeate the whole room and mist sank to the floor.

Practically every commercial pharmaceutical house in the U.S.A. is putting out something with chlorophyll in it. One company, concentrates on the medical angle, is producing deodorant tablets while still furthering work in the healing of ulcers, wounds, burns, bedsores and the like.

In an article published in Post-graduate Medicine, Dr. K. F. Leroy reports that Chloresium ointment applied to a leg ulcer following a burn, a skin ailment due to elephantisii and crush injury of the hand, speeded up the growth of new skin over the wounds, and was soothing and non-toxic.

In the Journal Lancet, Dr. B. J. Niemiro reported using Chloresium ointment in over a hundred cases of prionidal cyst operations. This is a sinus infection at the base of the spine. It is a troublesome condition and even after surgery the wound takes a long time to heal. Routine Chloresium application produced prompt, clean healing. Of five cases not so treated four hung on for four months after operation, and one for four weeks. All five healed in 8 to 18 days after treatment with Chloresium.

Drs. Combes, Zuckerman and Kern will report in the New York State Journal of Medicine on the use of Chloresium ointment and solution in 98 cases of dermatitis of various kinds. Thirty-five were cured and a similar number "improved".

Dr. L. J. Pollock and others reported in the Journal of the American Medical Association that chlorophyll ointment and solution were the most effective of 11 agents in management of bedsores, especially in paralegics.

In other cases, scientific papers in medical journals report a high degree of success in the hastening of healing with the minimum of scar tissues. Observers have remarked, that this seems to be proof that primitive man instinctively had some tricks we didn't have when he turned to green leaves for the treatment of wounds. Though our early ancestors didn't know it, chlorophyll was what did the work.

POULTRY AS A SECONDARY INDUSTRY

The word poultry means the varieties of domesticated birds, that produce eggs and meat for human consumption; and it then, not only includes all the different varieties of hens but ducks, geese, turkeys and pigeons too.

In a vast country like India where two-thirds of the population makes its living from farming, it is absolutely essential to have some sort of secondary industry as a subsidiary one to farming, so as to enable them to utilize their unoccupied time and unused material in producing something more to make comfortable living. One can think of many such secondary industries for instance, making yarn, weaving, rope making, and so on, but none of the above would be more profitable and a more fitting adjunct to the farming profession than that of keeping and managing a small poultry farm.

ADVANTAGES OF POULTRY AS A SUBSIDIARY INDUSTRY

The reasons for it as a secondary industry to the farmer are :—

First :—It requires a very small investment to make a successful start. A dozen or two high laying birds with ordinary neat and comfortable house and yard would cost him not more than Rs. 500/-.

Second :—The cost of rearing and maintenance would be practically a small amount as the farmer would be utilizing his surplus unclaimed grains from godowns, threshing yard and the field-waste. Under strict city conditions even the maintenance of a hen including every thing works to three pies a day only.

Third :—The labour is very small and of a nature that all the members of the family, men, women, children, young or old, infirm or shirking from hard manual labour, can take part in it with ease and interest. Women or girls who often remain at home would best do this job, as they have the inherent trend to look after little details and observe cleanliness—the first two key-notes in successful poultry keeping. One person can easily manage two dozen fowls.

Fourth :—It starts giving returns on the very day and every day throughout the year. Steady income for every day means profitable occupation and credit with neighbours. Two dozen hens managed by one person would give one dozen eggs a day worth Re. 1/-.

Fifth :—It is an aid to crop returns in a way that the poultry manure adds to soil fertility, that birds pick up all weed-seeds, catch and eat all the injurious insect pests found in the field on the crop and animals, even the scorpions, millipedes and young snakes which are dreaded enemies of the farmer are tackled and eaten by them.

Sixth :—It is an industry the products of which are very little affected by the competition and slump of the distant and foreign markets. Even if the produce is unsold at any time, it can be economically utilized in the house-hold for bringing up bonnie babies and robust parents.

Seventh :—It is a very healthful, interesting and invigorating occupation.

It has only two disadvantages and one that it requires constant attendance the other is the often unwarranted fear expressed of having an outbreak of contagious diseases and heavy casualties inflicted thereby. This latter is wholly due to inattendance and negligent management.

PRESENT NEGLECTED CONDITION OF STOCK REARING

As it is now, the fowls seem to have been maintained as an unaccounted incident, the birds living on any accidental food or refuse as they picked up in the free range, drinking any dirty water they got, having no protection from the fatal attacks of their enemies except during night when they are shut up in an insanitary mud-made dungeons; and up to the present time even, the breeding has been very indiscriminate one, proper feeding has been neglected and no attention has been given during their ill-health. The only fowl that seems to have received any care was the game bird Adil for its exciting fighting qualities. The present Indian fowl is non-descript, miserable ill-looking and undersized bird; it weighs 1 to 1½ lbs. only, starts laying at the age of seven months, and lays sixty eggs a year of unattractive appearance and tiny size 1 to 1½ oz. in weight; while its original migrated sisters of western countries under systematic management, now weigh 4½ lbs.; start laying after 5 months and lay yearly 175-240 eggs of very attractive appearance, and huge size of 2½ to 2¾ ozs. each.

PROGRESS OF POULTRY INDUSTRY IN OTHER COUNTRIES

In other countries the poultry industry as a subsidiary or specialized one has progressed to an unimaginable success. The 1922 statistics of United States of America show that there has been 600 crores of rupees worth poultry produce more than their wheat production, and that little country like Denmark with one crore areas of cultivable land, in other words 1/6th of cultivable area of our Bombay Presidency, produces annually 4½ crores Rs. worth poultry produce and exports eggs worth more than 2½ crores of Rupees while this very tiny country sixty years ago exported 27,000 Rs. worth poultry produce. Even the backward country like China exports nearly 4 crores of rupees worth eggs in a dry and liquid form.

The underlying cause of such big national income of these countries is that the industry is conducted with proper knowledge, practice and organization as a secondary occupation subsidiary to agriculture.

FACTORS CONDUCIVE TO SUCCESS

Those factors can be summed up in three cardial rules :—

First :—Training in the science and practice of poultry culture including breeding on right lines, rearing and feeding on rational basis, comfortable housing and proper care during their illness

Such training facilities are available at the Government Central Poultry Breeding station attached to the Agricultural College Dairy, Poona.

Second :—Making a start with best foundation stock of high capacity laying hens and breeding cocks from well acclimatised layers giving not less than 150 eggs a year and above 2 ozs. in weight each. Such birds would not cost more than Rs. 5 per pullet and can be obtained from the Government Central Poultry Bredings Station at Poona.

Third :—Improved ways of marketing from the producer to consumer are essential for this industry also. These can easily be brought about by joint co-operative efforts through the help of Co-operative Department.

AGRICULTURAL OPERATIONS FOR APRIL

FOR THE PLAINS

Vegetables :—Little can be done now in the cultivation of vegetables.

Well water Asparagus.

Gather seed of onion and Salsify.

Put yams in the ground, and construct trellis-work for them to trail upon.

Fruits :—Water Melons unremittingly. Keep Strawberry plants watered while the hot season lasts.

Ornamental Plants :—The leaves of Gladilous and some other bulbous plants will be dying down. The pots containing them should be removed to some dry place, where they may remain till the time for re-potting comes round again.

Achimenes, which at this time will be starting into growth should be potted and well watered as soon as they appear above ground.

FOR THE HILLS

Vegetables :—This is also a busy month. Successive sowings should be made of the vegetables sown last month. Water the transplanted seedlings copiously.

Fruits :—Strawberries will now be ripening, and should be watered copiously or the fruit will be small and wanting in taste. Water other fruit trees sufficiently.

Flowers :—Roses, Geraniums, and Fuchsias will now be making rapid growth, and should be kept well supplied with water. An occasional application of liquid manure will have a good effect, especially on Roses in pots and tubs. Dahlia bulbs should now be looked to. They should be carefully turned out of their old pots and planted in fresh, rich—the richer the better. Tubers of Saladium Alocesias, Gesneras and Gloxinias should now be planted in pots together with tuberous rooted Begonias. Cuttings of Roses, Geraniums, Fuchsias, Begonias, etc., if put down now will strike very readily.

Scientific Researches & Inventions

LEATHER RESEARCH INSTITUTE ON THE INDIAN VEGETABLE TANNING MATERIALS

A systematic investigation of the acid and salt contents in Indian vegetable tanning materials has been undertaken by the Central Leather Research Institute, Madras.

The factors, which control vegetable tanning processes, are tannin concentration, salt and acid contents, temperature, etc. Therefore, from the practical tanner's point of view, it is important to analyse acid and salt contents. Tan liquors made from different tanning materials vary widely in their effects and produce leathers with different physical and chemical properties. The study will thus pave the way for controlled production of leather of various qualities.

The studies have shown that Wattle belongs to the low acid and low salt group, while Avaram, Konnam, Karada, Goran and White-valem barks belong to the low acid and high salt group. Myrobalan, Dividivi and Dhawa leaves belong to the high acid and high salt groups.

INSULATING BLOCKS FROM COCONUT PITH

Coconut pith has great possibilities as an insulating material, according to the results of investigations carried out at the Central Research Institute, Trivandrum.

Coconut pith is the light fluffy refuse obtained during the separation of coir fibre from coconut husks. This material has no manurial value and is mostly used for the reclamation of background areas by dumping it on backwater edges. As the pith resembles cork dust physically, investigations were undertaken.

As a result of these researches, coconut pith has been found to be a very good insulating material. The blocks, prepared from it after admixture of rubber latex as a binder, were tested. They were found to be quite suitable as insulating material in the ice boxes used for the commercial transport of fish.

ROT-PROOFING JUTE FABRIC

A process for strengthening the resistance of jute and similar material has been evolved as a result of researches undertaken at the Indian Jute Mills Association Research Institute, Calcutta.

Jute and other cellulosic textile materials can be rendered resistant to attack by micro-organism by treating with cuprammonium solution. The cost of the treatment is negligible, and during the last war over 200 million yards of sand bag hessian was made rot-resistant by means of the cutch-cuprammonium process. The effect of the treatment was thought to increase the services life of the sand bags by five to eight times.

Investigations showed that sodium and ammonium sulphate, which get precipitated on the fabric during the treatment, were mainly responsible for the damage. The damage might be due to liberation of mineral acids from ammonium salts. Although the removal of the soluble saltst by washing after copper has been deposited in insoluble form i.e. after drying, largely prevents deterioration, this may not be practicable owing to the additional cost of drying.

The process, now developed eliminates the presence of excess sulphate ion on the fabric. While retaining the rot-proofing efficiency of the older method, it leaves the tensile strength of the fabric unimpaired.

EXTRACTION OF OIL FROM KAMALA SEEDS

A technique for the fuller extraction of oil from Kamala seeds has been evolved as a result of investigations carried out at the National Chemical Laboratory, Poona.

The oil is used in varnishes and paints. The solvent used at present is petroleum ether. Investigations, however, show that Kamlolenic acid, the major constituent of the oil, is not entirely extracted by this solvent. An almost equal quantity of the oil containing higher percentage of this acid was extracted from the residual seed cake with ether or benzene. All the oil in the seeds can be extracted with ether, ethyl acetate or benzene.

The high cost of the first two solvents will probably eliminate them for use on large scale. The distillation losses in the case of ether will also be comparatively high and for these reasons benzene, which is now commercially available in India, seems to be the most satisfactory solvent for the extraction of Kamala oil.

UNIVERSAL POWER PLATE SHEARS

The Universal shearing and punching machine may be profitably used in sheet metal workshops machine works, in tinsmiths' and fitters' shops, car body works and for pipe system constructions and boiler making. The machine cuts all ordinarily needed figures and shapes from iron, metallic and non-metallic sheets and plates up to a thickness of 6 mm. The cutting speed, which of course is dependent on the thickness of the material being worked, amounts to several meters per minute. Cutting can be done from the edge or right from the middle of the sheet using either the cutting blades or the notching and die. The machine permits cutting to scribbed lines or with the help of templates of any desired shapes of blanks as for instance, rounds, ovals, plates, circles, strips, slits etc. The sheet of the metal is sheared in any inside or outside curves wanted or edge planed and trimmed. The edges are clean and smooth so that the work does not need any finishing touches or operations. A stop gauge ledge enables the operator to make straight cuts with utmost accuracy, while a centering attachment permits to cut rounds and sectors. The cutting blades will be used where straight lines and wide curves must be cut, the notching punch and die being better suited to work narrow slits and small curvatures. If equipped with special tools the machine may also be employed for beading, cornice making, folding and burring operations.

The entire drive and working machanism is housed, dustproof and protected against scale, in guide head securely bolted to the machine body. The eccentric shaft is driven by a 2.7 H.P. standard motor built into the machine base. The power is transmitted over an infinitely variable gearing unit which allows changing the number of strokes while the machine is working and which, in addition, effects a smooth and joltless drive.

The upper tool swivels in a full circle around the bottom tool and is secured in its individual working position by a set knob attached at the side. The feature makes long cuts in all directions possible without making any shifting of the sheet being worked necessary.

The tool holder may be raised or lowered by turning hand-wheel. Its height can be adjusted to the use of either the cutting blades or the notching punch and die and is, of course, also determined by the thickness of the material. The vertical adjustment makes also cutting out of the middle of the material possible without necessitating any prepunching.

The length of the stroke, that is, the cutting depth of the tool, can likewise be adopted to the thickness of the sheet material worked. The laterally arranged hold-down attachment is vertically adjustable too, and slewable. The machine gets started and stopped by simply pressing a push button switch.

HEAVY-DUTY FOLDING PRESS

These presses render valuable service for making shapes of all types, parts for the doors, windows, railings, stairs, linings of castings of all kinds, conveyor troughs, containers, tubing steel furniture, car bodies, rail road carriages, locomotives, agricultural machines etc. They can be employed for making structural shapes of sheet steel as well as of light metal alloys. The support of the folding press as well as the table and the ram are made of roled steel plates. The entire support of the press is welded together and has crew joints only as far as required for the transportation of the machine. Table and ram are amply dimensioned in order to balance the deflections of the two parts. As a safety device in the case of longer folding operations requiring two attendants, the operating levers are arranged in such a way that the attendants must operate the starting levers at the same time. The machine stops working immediately if one of the operators takes his hands off the starting lever. Twelve sizes are constructed *i.e.*, for pressures from 31.5 tons to 630 tons. The following lengths are stepped from 1,600 to 5,000 mm. in which case 4 models with different folding lengths are available.

INDIAN TEA

Mr. H. A. Bennet, Tea Controller, Australian Tea Importation Board, recently told Calcutta's tea traders at a reception given him by the local tea merchants' association, that they would do well to make a proper approach to the Australian market which had a good potentiality. Mr. Bennet urged that more representatives of the trade should visit his country to establish trade contacts. Analysing the trends prevailing in the Australian tea market, he pointed out that before the war, Australia used to buy 70 % of her requirements from Indonesia. To-day, Ceylon has come out as her main supplier of tea, the two factors to be reckoned with in this connexion being prices and quality. Mr. Bennet held the shipping problem to be a great obstacle in India's trade with Australia, Indonesia and Ceylon occupying more favourable geographical positions. Disappointment was expressed at the reception by the Chairman of the Association, that part of the trade which Indonesia had lost, did not come to India. Whatever the future prospect of our trade with Australia in tea, one cannot ignore the fact that at present we are feeling perturbed over our dwindling volume of business in the commodity with that country. This is all the more regrettable in as much as the per capita consumption of tea in Australia is being maintained at a high level.

INDONESIA'S DESIRE

Indonesia wants to trade direct with the USA, Britain and Russia, as recently made clear by her first Ambassador in Britain, Dr. Subandrio. As long as the country was in the Netherlands East Indies, all her trade was done through the Netherlands, and 90 % of her export and import was run by foreigners, mostly Dutch and Chinese.

Dr. Subandrio said, "We want to see more of the trade in the hands of Indonesians. The Dutch realize that they transfer some of their economic activities to us, but the thing now is not so much a transfer of interests from one people to another as a sharing of them as the four-year-old Republic moves towards a new economic equilibrium.

"Our relations with the Dutch are good. I am confident Indonesia will solve her racial and economic problems, but it will take 25 years before we shall be on an equal footing commercially with the Dutch and Chinese in our midst."

Indonesians, numbering about 70,000,000 provided virtually all the manual labour on the rubber, coffee and tea plantations and in the tin mines, he added. Much of the business was in the hands of the 2,500,000 Chinese. About 60 % of the national income before the war went to the Chinese and the 145,000 Dutch.

WORLD COAL

According to a recently published U. N. Bulletin, the world coal production has been declining for the past two years. The record figure of 1475 million tons was reached in 1951.

Factors responsible for the decline were changing conditions in North America and more especially the strike in the U. S. steel industry in the middle of 1952, the U. N monthly bulletin of statistics stated.

"Dieselization of railways and the rapid extension of natural gas networks were also contributory factors in the decline of output," it added.

"Improvements in the coal situation elsewhere during this period, especially Europe, resulted in further cuts in the need for U. S. coal.

"North American output, as a result of these and other factors, declined from 535 million tons in 1951 to 447 million tons in 1953."

Elsewhere in the world production increased by 55 million tons between 1951 and 1953. East Europe and the Soviet Union contributed 35 million tons of this total, Western Europe and Asia most of the remainder.

BRITAIN'S HEADACHE

British shipping is likely to face increased foreign competition in future. The annual report of the Liverpool Steamship Owners' Association makes the above point and referring to the competition offered by Germany and Japan, says :—

"They are now returning in force and have to be regarded as an increasing the competitive factor," the report said. British shipping would not easily maintain

its present share of world trade against the renewed overseas competition.

"British shipping is being faced by new or increased competition from flags which before the war were of little competitive account and in particular from South and Central American countries seized with the urge to establish their own mercantile marines," the report warned.

Argentina, Liberia and Panama were among those nations which made the largest individual developments in foreign fleets since 1936. There had also been large increases in tonnage by Brazil (97 %), Denmark (83 %), Norway (74 %) and Sweden (148 %).

Germany's fleet last year was at less than half the pre-war strength but Japan's was already above two-thirds of its strength before the war.

The report pinpointed the rising overseas competition by revealing that Britain last year owned 25 % of the world's ocean-going vessels, over 2,000 gross tons compared with 29 % in 1936 and 33% in 1929. Before World War I Britain's share was 50 %.

RUSSIAN ECONOMY

M. Malenkov recently told his constituents that the Soviet Union stood for peaceful economic competition between herself and the capitalist countries including the USA.

Speaking of his country's domestic affairs he said that in the past four years workers' wages had risen 58 % ; consumer goods output too had gone up; housing shortage was liquidated and many new houses built. National income from 1949 to 1953 had increased by 2 % and in 1953 it was twice as large as pre-war. He added that the policy of heavy industrialisation was the basis of Russian economy and the foundation stone of her defence. As pointed out by M. Malenkov, the growth of heavy industry has enabled the Government to embark on a considerable increase in the consumer goods output in the next two or three years. The last half of 1953 saw more than 30,000 million roubles worth more of consumer goods put on the market than in the first half of the year.

Great stress is being laid at the present moment on the quick development of agriculture. The Government has drawn up a programme to eliminate the lag in important branches of agriculture.

M. Malenkov said that even though productivity had risen six-fold in industry, by 3.5 times in railway transport and by 3 times in agriculture since the revolution, the picture would be quite different "if we look forward to meet the growing demand of our people and competing with the economy of leading capitalist countries."

DEVELOPMENT COUNCILS FOR TWO MORE INDUSTRIES

CYCLE AND SUGAR

The Government propose to set up Development Councils for the cycle industry, and for the sugar industry.

The Government has already set up two Development Councils, one for internal combustion engines, and power-driven pumps, and the other for heavy chemicals (acid and fertilisers).

The first Council, which met twice, is engaged in the working out of ways and means for a fuller utilisation of the existing capacity in the country for the manufacture of diesel engines. The other Council held its first meeting in June last year.

REGISTRATION OF INDUSTRIAL UNDERTAKINGS

Government have begun the registration of existing industrial undertakings pertaining to the eight new industries brought within the scope of the Industries Act as amended, and also such of those undertakings pertaining to the old industries which might not have registered themselves already.

Government have allowed in the rules, newly amended, a period of eight months for the registration of existing undertakings.

The process of the licensing of new units, and expansion of existing ones is progressing smoothly. Since the last meeting of the Council in May, the Licensing Committee had examined 118 applications for licences. Of these, the Committee had recommended the grant of licences in 87 cases; 34 of these related to cotton textiles, eight to pharmaceuticals, and drugs, eight to vanaspati and vegetable oils, seven to heavy chemicals, six to rubber goods, four to cement, four to glass and ceramics, and the rest other industries.

The Sub-Committee of the Council held a meeting under the Chairmanship of Pundit Hirday Nath Kunzru. It reviewed 153 applications which had been dealt with by the Licensing Committee and endorsed all the recommendations of the Licensing Committee. This Committee also examined certain general principles to be followed in the licensing of new units, and expansions.

On other subject placed before them was the framing of rules for elucidating the meaning of the expressions "substantial expansion," and "new articles," occurring in the Industries Act. These expressions were already defined in the Act itself. It had, however, been suggested that there meaning should be made clearer by framing suitable rules.

The expressions, as they stand, do not admit of further elaboration in regard to details and the task of framing rules at this stage to regulate this matter is rather difficult.

Government have ordered the investigation of the affairs of seven sugar mills, and three cotton textile units. The reports in respect of one of the textile mills, and five sugar mills have been received.

Two alternative courses are open to the Government under the Industries Act. If the investigation showed that the situation is such as could be met by the issue of directions to the management it is open to the Government to use this method. Section 16 of the Act provides for the issue of such directions. If the situation is however such that the only practical remedy is for the Government to take over immediately the operational control of the undertaking without issuing directions, the Government have power to do so under Section 18-A.

COMMITTEE TO REVIEW TRADE MARKS LAW

The Government of India have appointed a Committee to review the laws in India bearing upon trade marks and merchandise marks on goods and to suggest what changes and modifications are necessary particularly to ensure effective remedies against infringements. The Committee will consist of Shri K. S. Shavaksha, Registrar of Trade Marks (Chairman); and Shri Raman Bhai B. Amin and Shri K. T. Chandy, Members. Shri A. Alagiriswami will be the Secretary of the Committee.

The services of Mr. C. P. Whyman an expert from the U. K. have been obtained by the Government of India. Mr. Whyman will act as Adviser to the Committee.

The headquarters of the Committee will be at Bombay. The Committee will also visit such other places as it may consider essential for purposes of its enquiry.

ALL-INDIA ORGANIZATION OF INDUSTRIAL EMPLOYERS, NEW DELHI

The following are extracts from the presidential address of Mr. Mohanlal L. Shah, at the twentieth annual session of the all-India Organization of Industrial Employers, at Ahmedabad :

"Since we met last year in July, there have prevailed good industrial relations. The first Five-year Plan is being implemented although the first two years' progress report would seem to indicate that the rate of investment both in the public and in the private sector is lagging behind schedule. The capital market is still far from being revival and funds are still scarce. Some of the industries have been facing difficuties on account of the changed market conditions. There is greater consumer resistance and yet on account of a number of factors, industries are finding it difficult to reduce the cost structure. The general state of uncertainty has reflected itself in the relative stagnancy of fresh investments. At the same time there are grave portents of increasing unemployment. "The Five-year Plan no doubt refers to this vast and complex question of unemployment, but the solution that it offers is at best a palliative. As against the estimated working popuation of 133 million, additional employment of 5 million only at the end of the Five-year Plan is envisaged and this will be mostly in agriculture and cottage industries. The real solution can come only when the industrial economy of the country becomes able to absorb the surplus population from the rural areas and provide them with productive employment.

"It must be admitted, however, that in offering employment the cottage industries and the smalll-scale industries in the country have an important part to play, provided modern methods of working are adopted and they function as economic units. As a short-term measure it cannot be denied that cottage and small-scale industries have to be invigorated in order to sustain employment in the country. The utility of such policy, however, is mainly palliative. Apart from the small-scale industries, Government's policies also need generally to be geared to the creation of additional employment. For instance, we are at present importing a number of items the production facilities for which exist in adequate quantities in the country or items which could be manufactured with our existing resources. What one must realize is that by importing articles which can as well be manufactured here, we are reducing to that extent opportunities for employment.

"In this connection, I feel compelled to refer to the import policy of Government which is largely governed by balance of payments consideration, *i.e.*, the import of goods is increased or decreased according to the improvement or otherwise in our balance of payments position. To the extent that restrictions on imports help maintain and increase indigenous production, or enable the starting of new lines of production, they are instrumental in increasing the scope for employment. This aspect—and not merely the exigencies of the balance of payments position at any particular time—should be the guiding factor and the objective of Government's import policy.

PROPOSED LABOUR LEGISLATION

"The Organization has always held that it is necessary to revise the Industrial Disputes Act, 1947, to have a unified policy. As you know, although the Industrial Disputes Act, 1947, is applicable to the whole of India, some of the States like Bombay, U. P., and Madhya Pradesh have their own legislation for regulating industrial relations. According to Article 251 of the Constitution, when there are both Central and State laws on the subject, both will be concurrently operative, and in the case of a contradiction, the law made by Parliament will prevail. In States which have their own laws, therefore, a party can evoke the Central or the State law. The present legislation relating to industrial disputes in the country is thus characterized by lack of uniformity and has resulted in considerable embarrasment and confusion. Further. the Industrial Disputes Act also contains some provisions which are not conductive to the smooth running of our industry. Section 33 of the Industrial Disputes Act which prevents an employer from taking disciplinary action during the pendency of proceedings is an instance. Moreover, under the existing legislation the jurisdiction of the adjudicators is not clearly defined and there are several cases where they have not only given awards in excess of the standards laid down by law, but have also encroached upon the jurisdiction of the legislature by laying down new principles. There are several other aspects of present

law which require modification. If the proposed comprehensive legislation is to serve the objective of bringing about better employer-employee relations through conciliation and direct negotiation, it must also remove the other drawbacks of the Industrial Disputes Act of 1947.

"There seems to be a feeling among the labour leaders that the employers are more anxious for the removal of compulsory adjudication machinery, for they are in a stronger position than the emphasis at my command, that the employers are as keen as anybody else to foster the growth of healthy trade unionism in this country and that they believe that responsible trade unionism can be evolved only through direct negotiation and conciliation. While, no doubt, in exceptional cases or where it is a question of public emergency, compulsory arbitration or adjudication may be permissible, it is desirable that the normal method of settling disputes should be through mutual negotiation and collective bargaining, through voluntary conciliation by machinery prescribed by law or through voluntary arbitration by machinery chosen by the parties, in that order.

RETRENCHMENT AND LAY-OFFS

"Another question to which the Labour Minister referred in his Press Conference at Madras relates to retrenchment and lay-offs in different industries. While I have no desire to gloss over the real hardship to individual workers involved in the process of retrenchment, I cannot but fell that alterations in the labour force is an essential feature of a dynamic industrial economy. To my mind there are two issues here which are often mixed up: the question of retrenched personnel being unable to find alternative employment. It is obvious that it is not retrenchment that causes hardship, but it is the inability of a person to find within a reasonable time alternative employment. Depending upon circumstances, retrenchment in a certain unit or a certain industry may be an imperative necessity. In a modern economy which is essentially dynamic, changes are continuously occurring in every sphere of industry—changes in the demand for finished goods, changes in the supply of raw materials and changes in the methods of production. There are a host of uncertainties which necessitate immediate action on the part of the management and should such action be impeded and curtailed, it will only result in driving industry or the factory concerned to the wall, with losses to all parties, including labour. Basically deciding upon the most economic combination of labour and capital is a job which must be left entirely in the hands of those who run the industry. No industrial tribunal, however qualified it may be in the judicial field, or any preconceived legislation will be able to undertake this work in the way it should be done. The proper way of tackling the question of rationalization and consequent retrenchment is not by making it difficult for the employers to adjust their demand for labour but by pursuing an overall policy which makes for an expansive outlook in the industrial field generally. This rather than detailed and rigid provisions to protect the immediate interests of the retrenched personnel should form the basis of governmental policy.

COMPENSATION FOR INVOLUNTARY UNEMPLOYMENT

"Another question closely linked with that of retrenchment is the liability of the employer for payment of compensation for involuntary unemployment arising out of temporary stoppage or reduction of work due to shortage of coal, power, raw materials, etc., or overproduction. The extent to which such schemes of compensation can be made to function smoothly over the entire industrial field and to the satisfaction of all parties without prejudice to industrial development would depend mainly on the ability of the industry to pay. In a sense it is not fair to ask the employer to pay even under circumstances when he is unable to get any work from his employees and where the causes for such state of affairs are completely beyond his control. Ultimately, it merely means that while increasing the liability of the employer his cost of production is being raised. In a sellers' market he can possibly pass on the additional cost to the consumer; but in the present circumstances of a buyers' market the higher cost would merely mean that a further sqeeze is being applied on the earnings of industry. I trust that before the Labour Ministry formulates any specific proposals or tries to introduce some uniform legislation, it will give full opportunity to the interested parties to discuss this question in all its aspects.

Company Reports

Orissa Minerals Development Co., Ltd.

The directors of the above Company (Managing Agents: Messrs. Bird & Co., Ltd., Calcutta) submit the audited accounts of the Company for the half-year ended 30th June, 1953.

Raisings of iron ore at 1,96,606 (3,09,359) tons showed a decrease of 23,767 tons when compared with the previous half-year. Despatches at 1,69,176 (2,85,693) tons showed a small increase over the previous half-year. Exports were 34,362 (51,013) tons compared with 33,060 tons in the previous half-year. The decrease in raisings was due to the steel works order remaining at 25,000 tons per month which is the minimum under the Company's contract with them. In addition, the "go-slow" policy adopted by the workers at Burnpur towards the end of the half-year under review resulted in restrictions on despatches.

The profit and loss account after providing Rs. 1,61,537 (Rs. 1,22,809) for depreciation, Rs. 6,00,000 (Rs. 5,25,000) for taxation, taking Rs. 2,00,000 (Rs. 1,00,000) to general reserve, Rs. 2,25,000 (Rs. 1,50,000) to mechanisation reserve, Rs. 12,117 (*nil*) to workmen's compensation reserve, Rs. 1,15,000 (Rs. 1,00,000) to buildings reserve, Rs. 50,000 (Rs. 50,000) to equalisation of dividend reserve and including Rs. 1,22,922 (Rs. 42,938) brought forward from the previous half-year, shown a credit balance of Rs. 3,38,544 (Rs. 2,24,275) which the directors propose to dispose of as follows:—

In paying a dividend on the ordinary shares at the rate of 40 (30) per cent. per annum, without any deduction for income-tax paid by the Company Rs. 2,00,000 (Rs. 1,50,000) and in carrying forward Rs. 1,38,544 (Rs. 74,275).

The directors consider it important that the issue capital of the Company should be brought more into line with the actual capital employed in the Company's business and they therefore, have authorised the managing agents to make the necessary application to obtain sanction from the Controller of Capital Issues to capitalise reserves to the extent of Rs. 10 lakhs by offering one fully paid bonus share for every share held. It will also be necessary to increase the authorised share capital of the Company and steps will be taken to do this..

Champdany Jute Co. Ltd.,

The directors of the above Company (Managing Agents : Messrs. James Finlay & Co., Ltd., Calcutta) submit the audited accounts of the Company for the half-year ended 30th September, 1953.

The accounts after providing Rs. 1,49,642 (Rs. 1,28,313) for depreciation on block and Rs. 1,82,000 (Rs. 4,58,000) for taxation, show a balance at credit of profit and loss account for the half-year of Rs. 1,92,595 (Rs. 8,20,223) to which falls to be added the balance brought forward from the previous accounts Rs. 1,15,030 (Rs. 88,388) making an amount available for distribution of Rs. 3,07,625 (Rs.6,08,611). This amount, the directors recommend should be dealt with in payment of a dividend of Rs. 3 (Rs. 8) per share absorbing Rs. 1,77,492 (Rs. 4,73,312), leaving a balance to be carried forward of Rs. 1,30,133 (Rs. 1,35,299).

It has been necessary to write off a sum of Rs. 33,056, for which provision was made in previous accounts, in connection with a debit due for market difference on jute purchased in 1946 and 1947, but never delivered by the seller. In conjunction with the Company's legal advisers all possible steps have been taken to recover the amount due and it has now been decided that the cost of pursuing the matter further would be out of all proportion to any amount which might ultimately be recovered.

Buildings and machinery have been maintained in good condition and repair. The retaining wall on the bank of the river Hooghly at Champdany Mill was very largely completed during the only addition to buildings as shown in the accounts.

The new sacking weft preparing and spinning machinery ordered for Wellington Mill began to arrive during September and good progress has been made with its installation and initial operation since the accounts were closed.

In accordance with the provisions of the Indian Jute Mills' Association, Main and Supplementary Working Time Agreements, 12½ per cent. of the looms remained sealed and the Mills worked only 42½ hours per week throughout the six months under review. The labour have worked moderately well on the whole and production has been maintained at a not unreasonable level.

Pharmaceutical Recipes

BORIC EYE OINTMENT

Boric acid, in very fine powder	20 gr.
Simple eye ointment	480 „

Triturate the boric acid with a portion of the melted simple eye ointment until smooth and gradually add the remainder of the melted basis. Triturate continuously until the product is cold.

• To prepare simple eye ointment proceed as follows :—

Wool fat	50 gr.
Yellow soft paraffin	450 „

Melt together, filter while hot through coarse filter paper and sterilise by heating at 150°F for one hour.

CAMPHORATED SULPHUR OINTMENT

Sublimed sulphur, finely sifted		35 gr.
Phenol		52½ „
Resorcinol, finely sifted		52½ „
Camphor		52½ „
Solution of coal tar		87½ „
Lard	1 oz.	297½ „
White Soft Paraffin	1 „	297½ „

Triturate the sulphur and resorcinol with a portion of the white soft paraffin until smooth, add the remainder of the white soft paraffin and the lard, and incorporate the phenol, camphor and solution of coal tar previously triturated together until liquefied.

CHAULMOOGRA OINTMENNT

Chaulmoogra oil	10 grms.
Hard paraffin	40 „
Soft paraffin, white	50 „

Melt the hard and soft paraffin, together; add the chaulmoogra oil; stir until cold.

DUSTING POWDER

Starch	1 oz.
Zinc Oxide	1 „
Talc	1 „
Camphor	30 grains.

Mix.

ECZEMA PASTE

Resorcinol	1 oz.
Zinc oxide, finely sifted	2½ „
Starch, finely sifted	2½ „
Liquid paraffin	4 fl. oz.

Reduce the resorcinol to fine powder and mix with the zinc oxide, starch, and liquid paraffin.

HEADACHE POWDER

Phenacitin	40 gr.
Caffein Citrate	10 „

Mix and make ten packets.

MEDICATED COTTON OR LINTS

As a general rule it does not pay to make medicated dressings, but it may happen that something new is prescribed and has to be made extemporaneously. The following formulas and directions may be taken as a basis on which to work.

COTTON OR LINT WITH SALICYLIC ACID 5 %

Salicylic acid	1 oz.
Glycerin	2 fl. oz.
Industrial spirit	15 fl. oz.
Absorbent cotton	1 lb.

Dissolve the salicylic acid and glycerin in the spirit, and pour the mixture on to the cotton in such a way that it is fairly evenly distributed. Roll up the cotton into a ball, and wrap in clean calico. Introduce into a powerful hydraulic or screw press and squeeze until the liquid just begins to ooz out. Relieve the pressure, unwarp the cotton and fold up in a different way from the first, and again press. Take out and spread on a line, in an atmosphere free from dust, for the spirit to evaporate.

COTTON OR LINT WITH CARBOLIC ACID 5 %

Carbolic acid	1 fl. oz.
Glycerin	2 fl. oz.
Industrial spirit	25 fl. oz.
Absorbent cotton	1 lb.

Proceed as before.

COTTON OR LINT WITH IODINE 5 %

Iodine	1 oz.
Potassium iodide	1 „
Glycerin	1 fl. oz.
Industrial spirit	15½ fl. oz.
Absorbent cotton	1 lb.

Proceed as before.

COTTON OR LINT WITH IODOFORM 5 %

Idoform	¾ oz.
Methylated ether .730	36 fl. oz.
Absorbent cotton	1 lb.

Proceed as before.

N.B. All operations must be conducted always from lights and fires.

WASHABLE OINTMENT BASE

Cetyl alcohol	9.2 grams.
Stearyl alcohol	9.2 „
Sodium lauryl sulphate	1.5 „
White petrolatum	30.3 c.c.
Propylene glycol	10.0 „
Distilled water to make	100.0 grams.

Washable ointment base is an oil in water emulsion, thus, it can be easily removed from the skin with water. It is used as a vehicle for medicinal agents.

Recipes for Small Manufacturers

QUINCE EXTRACT

Fluid extract orris	2	ounces.
Oenanthic ether	1½	"
Linalyl formate	90	minims.
Glycerine	2	ounces.
Alcohol, 70 per cent, to	3	pints.

STRAWBERRY ESSENCE

Strawberries, fresh	16	ounces.
Angelica (California)	6	fl. oz.
Brandy (California)	6	ounces.
Alcohol	8	"
Water, quantity sufficient.		

Mash, the berries to a pulp in a mortar of bowl, and transfer to a flask, along with the Angelica, brandy, alcohol, and about 8 ounces of water. Let macerate overnight, then distil off until 32 ounces have passed over. Colour strawberry red. The addition of a little essence of vanilla and a hint of lemon improves this essence.

APRICOT EXTRACT

Linalyl formate	90	minims.
Glycerine	1	ounce.
Amyl valerianate	4	dr.
Alcohol	11	ounces.
Fluid extract orris	1	ounce.
Water, quantity sufficient to make	1	pint.

APPLE EXTRACT

Glycerine	1	ounce.
Amyl valerianate	4	dr.
Linalyl formate	45	minims.
Fluid extract orris	1	ounce.
Alcohol	11	ounces.
Water, quantity sufficient to make	1	pint.

APPLE SYRUP

Peel and remove the cores of, say, 5 parts of apples and cut them into little bits. Put in a suitable vessel and pour over them a mixture of 5 parts each of common white wine and water, and let macerate together for 5 days at from 125° to 135° F., the vessel being closed during the time. Then strain the liquid through a linen cloth, using gentle pressure on the solid matter, forcing as much as possible of it through the cloth. Boil 30 parts of sugar and 20 parts of water together, and when boiling add to the resulting syrup the apple juice; let it boil up for a minute or so, and strain through flannel.

BANANA ESSENCE

Cut the fruit in slices and place in a jar; sprinkle with sugar and cover the jar, which is then enveloped in straw and placed in cold water, and the latter is heated to the boiling point. The jar is then removed, allowed, to cool, and the juice poured into bottles.

CANDIED GINGER

Grate an ounce of ginger, and put it with a pound of refined sugar beaten finely, and continue stirring it till it is thick. Then take it off the fire, drop it into cakes, upon earthen dishes, keep them in a warm place to dry; they will be brittle and look white.

CANDLES

Paraffin wax	30	oz.
Stearic acid	17½	"
Beeswax	2½	"

Melt together and stir until clear. If coloured candles are desired a pinch of any oil soluble dye is dissolved at this stage. Pour into vertical moulds in which wicks are hung.

ETCHING IVORY ARTICLES

Although decorations on ivory articles such as umbrella handles, cuff-buttons, fans, book covers, boxes, etc., are generally engraved; the work is frequently done by etching. The patterns must be very delicate, and are executed in lines only the simplest way is to cover the surface with a thin rosin varnish. Then transfer the pattern and scratch it out accurately with a pointed needle. Otherwise proceed same as in etching on metal and stone, making an edge of modelling wax around the surface to be etched and pouring on the acid, which consists, in this case, of sulphuric acid 1 part, to which 5 to 6 parts of water are added. It acts very quickly. The lines turn a deep black. If brown lines are desired dissolve 1 part of silver nitrate in 5 parts of water, each for a short time, and expose the article for a few hours to the light, until the design turns brown. Very often etchings in ivory are gilded. For this purpose, fill the etched patterns accurately with siccatives, using a writing pen, dry, and dab on gold leaf. After a few hours remove the superfluous gold with a wadding, and the design will be nicely gilded. Etched ivory articles present a very handsome appearance if they are first covered with a silvery gloss, the design being gilded afterwards. For the former purpose the etched object is laid in the above described solution of silver nitrate until it has acquired a dark yellow colour. Then rinse it off in clean water and, while still moist, expose to direct sunlight. After 3 to 4 hours the surface becomes entirely black, but will take on a fine silverly lustre if rubbed with soft leather.

Formulas, Processes & Answers

DEODORISING NEEM OIL

1738 S. K. S., Benares—Wishes to learn a process of deodorising neem oil.

When neem oil is intended to make into soap it is better to boil with caustic soda solution and grain with salt or rather wash the soap with salt twice or thrice. In the process of boiling and washing the odoriferous substances will almost completely be ousted from the resulting soap. After the oil is completely saponified and washed it is fit to be mixed with the other soaps or boiled with other soap-stocks in the pan. But when the oil is not intended for soap-making it may be deodorised by the following way :—(1) Treatment with caustic lye and salt; (2) passing steam through; (3) animal charcoal treatment; (4) filtration. (1) put 10 lbs. of oil with 3 lbs. of water in a pan; heat the liquid upto 100°F add to it caustic soda solution of 38°Be 1/10 lb. (i.e. 1 %) and stir *for 2 or 3 minutes when the oil will turn opaque.* Add salt about 1 lb. and boil. Remove the scum until the oil is nearly clear. If the froth is too thin to be removed add more salt when it will be concentrated and easily removable. When no more dirty foam is visible remove the oil from fire and decant when settled.

STRAW BOARDS

Straw board is made either from grasses or grain straws such as rice or wheat; so also from bagasse, sugarcane tops, trash, bul-rush etc. The aim in the production of the pulps for board is not to get pure cellulose but just to make the material somewhat soft. Hence caustic soda used is not in full amounts required for treating the material for ordinary paper. The material is boiled with only 5 to 8 per cent caustic soda or 15-20 per cent lime for about 3 to 4 hours in open boilers or digestors at 25 to 60 lbs. pressure. This also gives a greater yield of pulp than that for paper making. The pups are not bleached and may or may not be sized and coloured. The concentration of the pulp in the vat is 3 to 4 % and depends upon the thickness of the board required. The average yield of the boards from these materials is from 40-60 per cent.

In pulp making the material is beaten fairly rapidly. Pulp for straw boards can also be made in a country chunam mill as is used for making chunam paste for plastering.

In making the sheets, the pulp taken on the mould is thicker than for the other varieties of paper. Sometimes two or three layers of wet sheets are placed one over the other in order to get a thick sheet. Instead of ordinary cloth hessian or jute cloth is used for couching the wet sheets of the boards. They must be pressed hard in order to make them stiff and strong.

Sometimes the pulps are loaded with coloured ochres (generally yellow ochre) to increase weight and give a smooth surface to the boards. For waterproof boards the pulp is sized with 2 to 3% of rosin. The wet-boards are dried in the fields. The boards are not allowed to dry hard but in a slightly damp state they are piled in a heap so that they may not warp. They are calendered in a heavy calender. Boards can never be properly hand glazed as they are too thick. If the boards are hard dried and bent or warped, they should be damped with water and piled in a heap and pressed with stones or in a screw press to make them flat before calendering.

Materials treated with caustic soda produce stiffer boards than when lime is used for their treatment. The yield of the boards depends upon the amount of the alkalies used in the treatment. The following data for board pulps from sugarcane trash will be useful.

Sugarcane trash	50	lbs.
Caustic soda	2½	„
Fuel for boiling for 3 hours	40	„

Power required for pulp making 4 units K.Ws. in 2 hours.

The pulp obtained is 24 lbs. or 48 %. As the quantities are small no labour data can be given. The usual size of the board is 25" × 32" with varying thickness. Each sheet weighs from 8 ozs. to 1½ to 2 lbs. according to the thickness.

SOLID EAU-DE-COLOGNE

752 S. L. V., Calcutta—Wants formulas of solid eau-de-cologne and hair dye pomade and process of manufacturing nicotin sulphate from tobacco waste.

I

This is generally considered as a more or less transparent alcohol soap. One method is to dissolve 8.5 gram of stearic acid in 50 gram of 90 p.c. alcohol. To this 1.3 gram of sodium hydrate dissolved in 40 gram of water are added. The mixture is warmed until it becomes clear. Now add essence of eau-de-cologne carefully to avoid loss by evaporation and any congealing action. Pour into mould and allow to set.

II

Mix 150 gram white gelatin (i.e., gelatin containing zinc oxide or tetanium oxide) with 750 gram hot water and let stand for 24 hours. Then add 50 gram 28°Be. glycerin in which about 1.5 to 2.5 per cent essence of eau-de-cologne and about 0.5 to 1 per cent recrystallised menthol have been dissolved. A preservative will be required for this.

III

Dissolve 20 to 25 gram essence of eau-de-cologne and 0.5 g. of menthol in 1000 gram of best grade paraffin wax melted on a water bath.

Stir well and cast in moulds. Sometimes almond oil is used with the eau-de-cologne. A satisfactory base can be prepared by dissolving about 10 per cent of good soap chips in alcohol

IV

Sodium stearate, Colloidal	325	g.
Aluminium Hydroxide, colloidal	20	g.
Glycerin	600	g.
Cologne Water Oil	50	g.
Menthol	5	g.

HAIR DYEING OIL

Silver Nitrate	1	g.
Ammonium Carbonate	1.5	g.
Rose wawter	20	drops.
Pomad·: (Flat Base)	30	g.

NICOTII' SULPHATE FROM TOBACCO WASTES

A simple process has been developed at the National Chemical Laboratory, Poona which renders recovery of nicotine sulphate from Indian tobacco waste, an economic proposition. Till now such recovery has not been regarded economically feasible, in view of the low content of Nicotine in the waste.

The process (covered by Indian Patent Nos. 45666 and 46994) consists of pulverising tobacco waste, mixing it with lime and extraction of the mixture with a solution of common salt. The process has been successfully tried by both on a laboratory scale and Pilot Plant Scale. The equipment required is simple and can easily be assembled.

Nicotine sulphate is a powerful insecticide, used in a concentration of 0.6 to 1.0 per cent in agricultural sprays. Its commercial form is a solution containing 40 % nicotine in the form of sulphate. To increase agricultural production by cutting down losses due to insect pests and also for improving the quality of crops, the demand for this useful insecticide is growing. At present it is entirely imported at a relatively high price.

Manufacture can be easily undertaken either by tobacco curing companies who would have available with them adequate quantity of tobacco waste or by established fine chemical manufacturers located preferably in the tobacco areas. When developments are undertaken on these lines, it is visualised that capital investments need not be heavy. The operations do not involve any elaborate technique and technicians already available with firms should be able to operate the units.

Parties interested in undertaking commercial production according to this process are invited to write for further details to the Industrial Economist, Council of Scientifiv and Industrial Research, New Delhi.

THE PRESERVATION OF EGGS

1072 R. K. S. M. Lahore—Wants detailed processes of preserving eggs.

of air carrying germs through the shells. Normally the shell has a surface coating of mucilaginous matter, which prevents for a time the entrance of these harmful organisms into the egg. But if this coating is removed or softened by washing or otherwise the keeping quality of the egg is much reduced. These facts explain why many methods of preservation have not been entirely successful, and suggest that the methods employed should be based upon the idea of protecting and rendering more effective the natural coating of the shell, so that air bearing germs that cause decomposition may be completely excluded.

Eggs are often packed in lime, salt, or other products, or are put in cold storage for winter use, but such eggs are very far from being perfect when htey come upon the market. German authorities declare that water glass more closely conforms to the requirements of a good preservative than any of the substances commonly employed. A 10 per cent solution of water glass is said to preserve eggs so effectually that at the end of three and one-half months eggs still appeared to be perfectly fresh. In most packed eggs the yolk settles to one side, and the egg is then inferior in quality. In eggs preserved in water glass the yolk retained its normal position in the egg, and in taste they were not to be distinguished from fresh, unpacked store eggs.

Of twenty methods tested in Germany, the three which proved most effective were coating the egg with vaseline, preserving them in lime-water, and preserving them in water glass. The conclusion was reached that the last is preferable, because varnishing the eggs with vaseline takes considerable time, and treating them with limewater is likely to give the eggs a limy flavour.

PRESERVING WITH LIME

I

Dissolve in each gallon of water 12 ounces of quicklime, 6 ounces of common salt, 1 drachm of soda, ½ drachm saltpetre, ½ drachm tartar, and 1½ drachms of borax. The fluid is brought into a barrel and sufficient quicklime to cover the bottom is then poured in. Upon this is placed a layer of eggs, quicklime is again thrown in and so on until the barrel is filled so that the liquor stands about 10 inches deep over the last layer of eggs. The barrel is then covered with a cloth, upon which is scattered some lime.

II

Melt 4 ounces of clear beeswax in a porcelain dish over a gentle fire, and stir in 8 ounces of olive oil. Let the solution of wax in oil cool somewhat, then dip the fresh eggs one by one into it so as to coat every part of the shell. A momentary dip is sufficient, all excess of the mixture being wiped off with a cotton cloth. The oil is absorbed in the shell, the wax harmetically closing all the pores.

III

Take about half a dozen eggs and place

the water below the boiling point, even for an instant), into a boiling solution of boric acid, withdraw immediately, and pack. Or put up, in oil, carrying 2 per cent or 3 per cent of salicylic acid. Eggs treated in this way are said to taste, after six months, absolutely as fresh as they were when first put up. The eggs should be as fresh as possible, and should be thoroughly clean before dipping. The philosophy of the process is that the dipping in boiling acid solution not only kills all bacteria existing on, or in, the shell and membrame, but reinforces these latter by a very thin layer of coagulated albumen; while the packing in salicylated oil prevents the admission of fresh germs from the atmosphere. Salicylic acid is objected to on the same grounds as sulphuric acid.

IV

Dissolve sodium silicate in boiling water, to about the consistency of a syrup (or about 1 part of the silicate to 3 parts water). The eggs should be as fresh as possible, and must be thoroughly clean. They should be immersed in the solution in such manner that every part of each egg is covered with the liquid, then removed and let dry. If the solution is kept at or near the boiling temperature, the preservative effect is said to be much more certain and to last longer.

CELLOPHANE ADHESIVE

Acacia	18	parts.
Glycerine	30	„
Water	52	„

Soak the gum overnight in the water. Then strain and add the glycerine.

PRINTING ON CELLULOID

Printing on celluloid may be done in the usual way. Make ready the form so as to be perfectly level on the impression—that is, uniform to impressional touch on the face. The tympan should be hard. Bring up the form squarely, allowing for about a 3 or 4 sheet cardboard to be withdrawn from the tympan when about to proceed with printing on the celluloid; this is to allow for the thickness of the sheet of celluloid. Use live but dry and wellseasoned rollers. Special inks of different colours are made for this kind of presswork; in black a good card-job quality will be found about right, if a few drops of copal varnish are mixed with the ink before beginning to print.

MENDING CELLULOID

Celluloid dishes which show cracks are easily repaired by brushing the surface repeatedly with alcohol, 3 parts, and ether, 4 parts, until the mass turns soft and can be readily squeezed together. The pressure must be maintained for about one day. By putting only 1 part of ether in 3 parts of alcohol and adding a little shellac, a cement for celluloid is obtained, which, applied warm, produces quicker results. Another very useful gluing agent for celluloid receptacles is concentrated acetic acid. The celluloid fragments dabbed with it stick together almost instantaneously.

SOLVENT FOR CELLULOID

Celluloid dissolves in acetone, sulphuric ether, alcohol, oil of turpentine, benzine, amyl acetate, etc., alone, or in various combinations of these agents. The following are some proportions for solutions of celluloid :—

I.	Celluloid	5	parts.
	Amyl acetate	10	„
	Acetone	16	„
	Sulphuric ether	16	„
II.	Celluloid	10	parts.
	Sulphuric ether	30	„
	Acetone	30	„
	Camphor	3	„
III.	Celluloid	5	parts
	Alcohol	50	„
	Camphor	5	„
IV.	Celluloid	5	parts.
	Amyl acetate	50	„
V.	Celluloid	5	parts.
	Amyl acetate	25	„
	Acetone	25	„

DENTAL CEMENTS

Fairthorne's Cement.—Powdered glass, 5 parts; powdered borax, 4 parts; silicic acid, 8 parts; zinc oxide, 200 parts. Powder very finely and mix; then tint with a small quantity of golden ochre or manganese. The compound, mixed before use with concentrated syrupy zinc-chloride solution, soon becomes as hard as marble and constitutes a very durable tooth cement.

CEMENT FOR FILM

To cement together celluloid and cinematograph films use the following :—

Soak 25 ounces isinglass in cold water until it becomes soft, then press out the superfluous water and place it in a pan over heat until it becomes tacky or into a heavy liquid.

Separately dissolve in 5 ounces of alcohol, 2 ounces of gum ammoniac and 1 ounce of gum mastic and into this add the isinglass liquid. Stir the resulting heavy cement rather briskly until well mixed. Clean well celluloid pieces to be cemented before above cement.

BLEACHING TALLOW AND FATS

Instead of exposing to the sun, which is always attended with danger of rendering fats rancid, it is better to liquefy these at a gentle heat, and then add ¼ in weight of a mixture of equal parts of kaolin and water. The fatty matter should be worked up for a time and then left to separate. Kaolin has the advantage of cheapness in price and of being readily procured.

Freshly burned animal charcoal would perhaps be a more satisfactory decolourizer than kaolin, but it is more expensive to start with and not so easy to regenerate.

Exposure of tallow to the action of steam under high pressure (a temperature of 250° or 260°F.) is also said to render it whiter and harder.

EMERY GRINDING WHEEL

530 N. D. M., Damoh—Wants to know a process of making emery grinding wheel.

Emery stones are prepared with emery powder using magnesite as binding medium. The feature of this process is that the pulpy mixture of magnesium chloride solution, magnesite and emery powder is placed in metal moulds, which are mounted on a jig-table, the vibration of which causes the specifically heaviest portions of the mixture, viz., the grains of emery, to settle down gradually to the bottom of the mould as compactly as possible, each grain having time to assume the most suitable position with regard to its neighbours. This process gives an emery stone consisting of 90 per cent of emery and only 10 per cent. of magnesite binding medium, the superfluous portions of the latter being forced upward by the jumping movement of the table, and then easily removed.

EMERY PAPER AND CLOTH

[illegible] T. R. N., Satna—Wants to know a process of making emery paper and cloth.

The old process of making emery papers and cloths of all kinds were to coat any convenient cloth or paper with glue and then to sprinkle on it an excess quantity of emery powder whilst the glue is still hot. Allow the glue to set and remove the surplus abrasive by inverting the paper or cloth and tapping it gently.

At the present day, "mechanical coating appliances are employed in which a band of paper or cloth. travelling rapidly passes between a series of rollers in such a manner that the glue applied to its upper surface is spread uniformly over the cloth to paper. The band next passes beneath a hopper from which flows a stream of emery powder (varying from 20 to 24 mesh according to type of article required), in rather larger quantity than is needed to coat it. The band of paper or cloth is then carried over further rolls and crossticks, during which movement the excess of abrasive falls away and a second coating of glue is applied to the band The paper or cloth then travels through a long drying chamber, heated by a current of air and is afterwards wound on rolls. As each roll is filled it is taken off the winding machine and removed to the stove, where it is kept until the glue hardens after which it is cut into pieces of the requisite size shape.

Reader's Business Problems

[Reader's business problems will be discussed in these pages. We invite the reader to write us his difficulties. As the department is in charge of an experienced businessman who is specially adept in dealing with such problems and to whom experiences of a large number of successful businessmen are available, his replies will lead the enquirer to a successful career. These replies will be published in the paper only and cannot be communicated by post.]

INDIGENOUS DRUGS

61 R. C. R. Chinsura—Do you think it would be a paying concern if I were to start a manufacturing business in Kaviraji medicines on the line followed by several existing firms ?

Answers :—In order to be able to make a business of this nature a paying one, it is necessary that you should either be a practising Kaviraj, fully conversant with the modus operandii of the preparation of Kaviraji medicines, or have at your disposal some efficient and reliable Kaviraj as your assistant, who could be entrusted with such manufacture. It has been now demonstrated beyond the shadow of a doubt that the rates at which Kavirajas of the old school used to charge for their remedies were altogether prohibitive, and that an honest man might sell them at a quarter of their former prices and yet keep a decent margin of profit and run a thriving business. As a matter of fact, one of the main reasons why people having real faith in the Kaviraji system of treatment, are nevertheless prevented from getting themselves treated by it, appears to be in the excessively high prices of the medicines prescribed. It is true that the opening of some Kaviraji firms has helped considerably in lowering prices, but there is still sufficient scope for many more firms of a like nature in the country. But you must carefully bear in mind that honesty must be your watchward in this line of business, more perhaps than in others. You must be careful to use all the ingredients mentioned in the books and use them exactly in the manner prescribed, if you want to attain popularity with your customers and discharge your full moral responsibility. Living as you do, in the muffassil, it will be easy enough for you to secure the different ingredients in the shape of herbs, plants &c. at a minimum of cost. You can at first meet the demands of the local public and after business thrives and flourishes, establish branches in the City and carry on an extensive advertising propaganda.

OPENINNGS FOR EDUCATED INDIAN LADIES

86 K. C. R., Midnapur—A girl of mine has passed the I. A. I am unable to provide for her further studies. The same reason operates strongly against her marriage as obviously I cannot give her away in marriage to one who is below her from an educational view point and have not the money necessary for her marriage with a bridegroom of high educational attainments. Though I am a Hindu, I do not observe the purdah. Can you tell me what arrangements I am to make for her future career ?

Answer :—This is a very complex question, the solution whereof involves issues of social and economic nature. At any rate, we are glad that you have told us that "although a Hindu, you do not observe the purdah." This has made matters somewhat easy for us. We fully appreciate and respect your unwillingness to marry your daughter to one who is below her from an educational viewpoint. It would no doubt have been eminently desirable if you could have managed to get her graduated. But if, as you have said, the financial difficulties, of which you are the best judge, be really insuperable, then we are afraid, there is no help in the matter. Why not ask your daughter to join one of these Insurance Companies as a canvasser ? The prospects are ample, and a smart and educated lady, after some preliminary training as is usually imparted to their canvassers by at least some of the Insurance Companies, is sure to make a good income by her activities. Competition is almost unknown as, unlike males, the number of ladies who have hitherto joined this line is exceedingly limited. The work, besides, is not likely to be very hard in nature. Anyway, we feel sure that the Insurance Companies will only be too glad to respond to your queries if you enquire of them on your daughter's behalf as to whether or not there is any prospect for her if she chooses to start as a canvasser of Insurance Policies.

Queries and Replies

703 K.S.S., Indore—You may collect bristles and sell to Indian dealers. Following is a list of bristle merchants: Alex Miller (Merchant) Ltd., 139, Canning Street, Calcutta; S. Mazumdar, 67B, Netaji Subhas Road, Calcutta; Oriental Brush & Bristles Co., 31-1, Tangra Rd., Calcutta; Allan M. Sadri & Sons, Mahatma Gandhi Road, Kanpur; Hind Bristle Co., Mulbery House, Agra and H. & S. Bros., 105, Kalpi Road, Kanpur.

704 B.N.B., Lucknow—Your previous letter is not traceable.

705 S.I.G.F., Karamadai—Your name has been entered in our book for future reference.

706 A.C., Silchar—Roots of turmeric are clean stripped of the fibrous roots and heated gradually in earthen pots, the mouths of which carefully closed by lids fastened with cowdung. The rhizomes are then stewed in their own juice and freed thereby of the raw smell. Afterwards they are dried in the sun for nearly a week, being protected night from dew.

707 C.L.K., Indore—Process of manufacturing absorbent cotton, gauze, etc. will be found in Manufacture of Disinfectants and Antiseptics published from this office, price Rs. 3/12/- including postage.

708 P.R.S., Calcutta—Touch paper is much used for igniting fire works and is made by brushing paper, usually blue in colour, or one side with a solution of nitre (half a pound to the gallon) and then drying. Slow match for pyrotechnic purposes is made by soaking blotting paper in lead nitrate solution 2½ lbs. per gallon and after drying, pasting the sheets together, usually so as to give six thicknesses. Pyrotechnic quick match on the other hand, is made by impregnating lamp wick cotton with a smooth cream of hot starch solution and meal powder, and then dusting it over with dry powder.

709 C.R.D., Allahabad—Following is a list of battery manufacturers: Associated Battery Makers (Eastern) Ltd., 4, Lyons Range; Bharat Battery Manufacturing Co. Ltd., P1-A, Rash Behari Avenue, Ballygunge; Chloride & Exide Batteries (Eastern) Ltd., 4, Lyons Range; Dipti Battery Co., 6, Satchasipara Road; East India Battery Industry, 26, Raja Dinendra Street; Flash Light (India) Ltd., 35, Prinsep Street; India Battery Manufacturing Co. Ltd., 1A, Lower Circular Road; Spark Engineering & Trading Co., 32, Jackson Lane and Tropical Accumulators Ltd., 32B, Mahim Halder Street; all of Calcutta.

710 A.T.C., Jorhat—We have no book dealing with the mannfacture of caffein from waste tea. As regards machineries required you may enquire of Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta.

712 R.S.P.S., Delhi—Fruit essences contain alcohol so they become milky white when water is added. There is no way of avoiding this defect.

713 S.S.G., Aligarh—Process of manufacturing all kinds of ink will be found in Manufacture of Inks published from this Office, price Rs. 3/12/- including postage. Fountain pen ink should be kept undisturbed at least one month when upper layer of the clear ink will be decanted slowly. Now this ink should be filtered and packed in phials.

714 N.D.M., Madras—For mixing and grinding machines enquire of Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta 1; Small Machineries manufacturing Co., 22, R. G. Kar Road, Calcutta 4; and Prabartak Commercial Corporation Ltd., 61, Bowbazar Street, Calcutta.

715 K.P.E., Trichur—You may use 5 per cent. ferrous sulphate solution for spraying on the leaves of pineapple plants. Spraying should not be very frequent. It may be once or twice in a full season.

717 R.M.S., Borsad—We have no arrangement for chemical analysis at present. For chemical analysis you may enquire of R. V. Briggs & Co. Ltd., 3 & 4, Garstin Place, Calcutta and Government Test House, Alipur, Calcutta.

718 L.B.C., Calcueta — Following is a list of hosiery manufacturers: A. K. Hosiery Ltd., 73-6, Grey Street; Annapurna Hosiery Co., 31, Ram Kamal Street; D. N. Bose's Hosiery Factory, 36-1A, Sarkar Lane; Kalighat Hosiery Factory, 231, Rash Behary Avenue; Lake Hosiery Mills, 21, South End Park; Kapoor Hosiery Factory Ltd., 8, South Sinthee Road; Belur Hosiery Mills, 62, Netaji Subhas Road and Onkar Hosiery, 7, Hazra Road; all of Calcutta.

719 J.D.S.K., Dhampur—Following is a formula of depilatory cream: Barium sulphide 80 grms; Atropine 5 grams; Spermaceti 100 grams.; Distilled water 200 grams., White petrolatum 300 grms. Melt over a water bath and mix and put in pots. This cream can be used as depilatory or can be applied every day for 20 minutes to stop the growth of unwanted hair.

721 P.T.K., Kota—Process of manufacturing utility products from skimmed milk will be found in Milk and Milk Products which you have already got.

722 P.S.L., Palamcottah — Candle making plant may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. Process of manufacturing glue will be found in Utilisation of Common Products published from this office, price Rs. 3/12/- including postage.

724 N.M.S., Bombay—Formulas of ring worm ointment, itch ointment, bindi and boot polish will appear in due course.

725 T.V., Madras—For doing agency business you should advertise in Classified Bargain pages of Industry. It is very difficult on our part to suggest names of firms that will take your service.

726 V.K.H., Bangalore — Plastic moulding powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta and Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

727 B.K.D., Srinagar — For selling the minerals you may negotiate with the following firms: Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane; Bagri Mining Syndicate Ltd., 15B, Clive Row and Indian Minerals Agency, 14/2, Old China Bazar Street, all of Calcutta.

728 H.L.A., Dalparsinghpura — Process of manufacturing glue from leather waste will be found in Utilisation of Common Products published from this office, price Rs. 3/12/- including postage. We have no book dealing with trade in bone.

729 S.M.S.N., Saharanpur — Formulas of paints and varnishes will be found in Prospective Industries. We have no book dealing with manufacture of all kinds of paints.

730 T.V.N., Vijayawala—As regards enamelling you may consult Jewellery and Enamelling by G. Pack to be had of W. and G. Foyle Ltd., Charing Cross Road, London, W. C. 2.

731 P.B.S.C., Calcutta—Boil the ink and add solution of borax. To make borax solution dissolve 2 parts of borax in 25 parts of water.

733 J.J., Salem—Crude oil hard paraffin, pitch etc., may be had of Burmah-Shell Oil Storage and Distributing Company of India Ltd., Hongkong House, Dalhousie Square; Caltex Company (India) Ltd., United India Insurance Bldg., Chittaranjan Avenue and Standard Vacuum Oil Company, 6, Church Lane; all of Calcutta. Montan wax may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

734 J.S.G., Chirala—Particulars of the Aryan Paper Mills Ltd., are not available. You may however enquire of Registrar, Joint Stock Companies, 23, Mission Row Extension, Calcutta.

735 D.A., Pilibhit—Our monthly magazine, Industry contains information regarding industrial, technical and commercial subjects. We also publish one directory which contains addresses of manufacturers, dealers and agents of India, Pakistan, Burma and Ceylon. Price of the directory is Rs. 17/- including postage. You may also consult Utilisation of Common Products published from this office, price Rs. 3/12/- including postage.

736 C.S.N.R.C., Erode—Talc powder may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane and Swaika Mineral Crushing Mills & Industries Ltd., 28-A, Pollock Street; both of Calcutta. Scents and essences may be had of Paradise Perfumery House, 7, Colootola St., and F. N. Sarkar, 37, Canning Street, both of Calcutta. Tin cans may be had of Bengal Tin Box Mnfg. Co. Ltd., 1, Jadu Nath Mitter Lane, Calcutta.

737 P.R.N., Undugoda—Following is a list of silk merchants; Girdhardas Haridas, Raghunath Das, Phatak Sukhlal Sahu, Banaras City; Raman Brothers, 13/45, Chowk, Banaras; Abdul Rehman Khan & Sons, General Bazar, Doddapet, Mysore; S. N. Muni Rao, Avenue Road, Bangalore City; P. Mudduramiah Chetty & Sons, Chickpet, Bangalore City and Krishna Textiles, 14, Hannurappa's Lane, Ramannapet, Bangalore City. You may negotiate with the above firms for silk sarees.

739 B.S.R., Masulipatam—For particulars regarding the towns mentioned by you consult a handbook of geography.

744 M.A., Madras—You may consult Indian Perfumes, Essences and Hair Oils published from this office, price Rs. 5/12/- including postage.

746 S.I., Tippera—Machines you require may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road; Francis Klein & Co. Ltd., 1, Royal Exchange Place and Jessop & Co. Ltd., 93, Netaji Subhas Road; all of Calcutta.

747 M.P.R., Karachi—We have no book dealing with the manufacture of transfer paper. An article on transfer paper manufacture appeared in February 1951 issue of Industry. As far as we know printing on glass is not done by ordinary process of printing with blocks and ink. Generally painting and etching are done on glass.

748 S.M.S., Bhagalpur City — For water testing apparatus enquire of Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta.

749 D.N.S., Dharmsala—We have no book dealing with the manufacture of cardboard and twine. You may however enquire of Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta.

750 N.C.S.R., Srirangam — We are not aware of the address of Dr. B. B. Batabyal.

754 T.L.S., Vallabh Vidyanagar—Precious stones and diamond are cut and then polished with jeweller's rouge. Following is a formula of jeweller's rouge: Green vitriol (crystals) 50 parts; Nitrate of soda (pure) 25 parts; Common salt 13 parts; Sodium sulphate 12 parts: Pulverise the ingredients separately. Then mix the green vitriol, saltpetre and common salt, stir the mixture with water to a thin paste and boil down the mass in an iron crucible to dryness. Now heat the mixture thus obtained in a hessian crucible at a red heat until it becomes quiet and homogeneous. Then pour it out and when cool powder ball with water for a few minutes and wash. It is advisable to somewhat elutriate the powder thus obtained to eliminate grains of sand which may have reached it from the crucible. Finally collect the powder upon a cloth and dry.

762 A.K.H.R.A., Dacca—Process of manufacturing all kinds of ink will be found in Manufacture of Ink published from this office, price Rs. 3/12/- including postage. We have no book dealing with the manufacture of colour and dyestuff. As regards a book on perfumery manufacture you may consult Indian Perfumes, Essences and Hair Oils published from this office, price Rs. 5/12/- including postage.

764 G.S., Raigarh—Addresses you require will be found in Industry Year Book and Direc

tory. For selling fat you may negotiate with soap manufacturers a list of which will be found in the above directory. The directory also contains addresses of newspapers and periodicals.

775 S.V.S., Ambur—Process of manufacturing all kinds of phenyle will be found in Manufacture of Disinfectants and Antiseptics published from this office, price Rs. 3/12/- including postage.

776 M.R.C., Mainpuri—Process of manufacturing rubber toys and erasers will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/12/- including postage.

777 N.V.H.W.V.U.S., Parvatipuram — We have no book dealing with the proceess of metals and minerals. You may however negotiate with R. V. Briggs & Co. Ltd., 3 & 4, Garstin Place, Calcutta and Government Test House, Alipore. An article on the manufacture of micanite appeared in last issue of Industry. You may consult Small Industries published from this office, price Rs. 2/4/- including postage.

778 P.C.I., Nyasaland — For glass bottles and jars enquire of P. S. Dutt & Bros., 8, Ezra Street; Imperial Glass Works, 9, Ezra Street; Krishna Silicate & Glass Works Ltd., 17, Radha Bazar Street and Indian Bottle Stores, 7, Ezra Street; all of Calcutta.

779 R.L.A., Raipur—Yes, you may start wire nail manufacturing business at your place with a small capital. Wirenail making machine may be had of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta. Wire may be had of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta. In this connection you may consult Mechanical Industries published from this office, price Rs. 3/12/- including postage.

781 B.N.D., Cachar—For learning handmade paper you may write to Khadi Pratisthan, Sodepur, 24 Parganas. There is no arnangement for teaching small glassware manufacture. You may consult Milk and Milk Products and Prospective Industries poth the books published from this office and price Rs. 3/12/- each including postage.

782 B.L.S., Jhansi—Process of manufacturing all kinds of toffee will be found in Manufacture of Confectionery published from this office, price Rs. 3/12/- including postage.

784 F.U.S., Tuticorin — Manufacture of Rubber Goods contains detailed process of manufacturing rubber stamps.

787 A.S.A., Delhi—Following is a list of cutlery goods dealers: C. J. Seth & Co., 48, Mangaldas Road, Princes Street, Bombay 2; Devidas Nandlal & Co., 241, Abdul Rehman St., Bombay; A. M. Nasiruddin, 60, Canning Street, Calcutta; Bengal Cutlery Works, 25, Swallow Lane, Calcutta and Indian Cutlery Manufacturers Co. Ltd., Netaji Subhas Road, Calcutta.

788 C.L.S., Batala—We have no book in Hindi. Following is a formula of ink for stamping leather goods: Make a pretty strong decoction of logwood, preferably in soft water by boiling, then add green vitriol at the rate of 2 oz. to the gallon and ½ oz. each of bichromate of potash and gum arabic. The last three ingredients and some times the logwood are powdered; instead of logwood chips extract of logwood may be used at the rate of 1 oz. to a gallon of water. We have no book dealing with the process of retipping gold nibs with irridium.

790 G.C.S.G., Calcutta—Following is a formula of hair dye; Pyrogallic acid 3.5 parts; citric acid 0.3 parts; boro-glycerine 11 parts; water 100 parts. If the dye does not impart the desired intensity of colour, the amount of pyrogallic acid may be increased The wash is applied evening, followed in the morning by a weak ammoniacal wash.

793 M.S.H., Bombay—For particular sweet making machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

795 R.S.R., Vijayavada—You may consult Pigments, Their Manufacture and Properties by J. S. Remington and Paint & Varnish Production Manual by V. C. Bidlack and E. W. Fasig. Both the books may be had of W. & G. Foyle Ltd., 119-125, Charing Cross Road, London, W. C. 2.

797 B.C., Delhi—Petroleum products may be had of Central Oil Co., 56, Brabourne Road, Calcutta 1; Motor & General Stores Supplying Co., Kothari Mansion, 3rd Floor, Opp. G. P. O., Mint Road, Fort, Bombay and National Petroleum Co. Ltd., Kirti Bldg, Forbes Street, Bombay.

799 V.C.C., Sialkot City—Process of melting steel scrap will be found in Practical Metal Casting by D. Dey published from this office, Rs. 3/12/- including postage. You may also consult a mechanical engineer specialist in melting scrap steels.

802 S.P., Kumbakonam—The artificial slate coating on tin consists of a mixture of finely ground slate, lampblack, and a sodium silicate solution of equal parts of potash and sodium silicate (sp. gr. 1.25). The process is as follows: First prepare the sodium silicate solution by finely crushing equal parts of solid potash and sodium silicate is completely dissolved. Add 7 parts finely crushed slate finely ground with a little water into impalpable dust, 1 part lampblack, which is ground with it, and grind enough of this mass with the previously prepared sodium silicate solution as is necessary for a thick or thin coating. With this compound the roughened tin plates are painted as uniformly as possible. In this way wooden slates may be manufactured.

803 K.C.T., Jharsuguda—Following is a formula of black fountain pen ink: Nigrosine, water soluble 1½ lbs.; gum arabic 8 oz.; hot water 25 gallons; carbolic acid 2½ oz. Dissolve the gum arabic in hot water and add the nigrosine slowly while stirring and the carbolic acid. Allow to cool and stand for a few days. Then filter and bottle.

806 F.S.C., Dacca—We have no book dealing with the manufacture of strawboard. For this book you may enquire of Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta and W Newman & Co. Ltd., 3 & 4, Old Court House St., Calcutta.

809 F.L., Jullundur City—You may consult Clerk's Manual published from this office price Rs. 3/12/- including postage. We have no book dealing with the manufacture of scented betelnuts. Following is a formula of scented betelnuts. Pulverise several betelnuts. Then mix with sufficient quantity of glycerine so as to moisten the powder. Next add a little pink colour which should of course, be harmless. Lastly add a small amount of menthol, eucalyptus oil, etc. to perfume the substance as delicately as possible.

811 D.N.P., Hazaribagh—Process of manufacturing fireworks will be found in Home Industries published from this office, price Rs. 3/12/- including postage.

814 P.K.J.V., Bhuj—You may consult Manufacture of Confectionery published from this office, price Rs. 3/12/- including postage.

815 S.B.N.S., Kathmandu — For dough making you should use either milk or vinegar as directed in the book.

816 G.S.A., Lucknow—Process of manufacturing printing ink will be found in Technology of Manufacture of Printing Inks by G. N. Sarama, B.Sc. published from this office price Rs. 3/12/- including postage.

817 L.C.W., Coimbatore — For envelope cutting machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta and Record Engineering Works, 1st Pathan Street, Bombay 4.

818 R.P.J., Jodhpur — You may consult Wide World English Correspondence by K. M. Banerjee published from this office, price Rs. 4/4/- including postage.

819 J.N.B., Banaras—Soap powder is simply soda ash and soap cooled, and ground to a powder. Sodium silicate is also used as an ingredient. In preparing the soap a little more water should be added than is used in finishing settled soap. Should the soap be finished too coarse the mixture of soap and soda ash in the crutcher may be too thick for easy working.

821 S.B.C.T.C., Secunderabad—Following is a formula of making coffee tablets : Take roasted coffee and grind it to coarse powder by means of a grinding machine. Then mix chicory powder in the proportion of 2 parts of chicory in every 8 parts of coffee or according to the taste of manufacturers. Then put the mixture in an automatic pressing machine and press into tablets. The size and shape of the tablets vary with the manufacturers. Some tablet manufacturers do not add any binding material, but others and about 15 per cent. glucose. Tablet making machine may be had of Small Machineries Manufacturing Co., 22, R. G. Kar Road, Calcutta 4 and Kilburn & Co. Ltd., 4, Fairlie place, Calcutta 1.

823 S.R.M., Hoogrijan—We have no book dealing exclusively with vulcanising. Process of vulcanising will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/12/- including postage. For vulcanising machine enquire of Geo Miller & Co. Ltd., 7, Hastings Street, Calcutta and Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta.

824 L.N.R., Puri—We have no book dealing with grafting.

825 K.K.T., Kathniyan—It is not possible to start a printing press with Rs. 5,000/- only yielding Rs. 500/- per month. You may start a soap factory with the above amount. If you can conduct the business efficiently you will get Rs. 500/- as net income.

828 C.K.R., Akividu — Filtering machines may be had of Subol Dutt & Sons Ltd., 13, Brabourne Road, Calcutta; Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta and Volkart Bros. Ltd., 8, Netaji Subhas Road, Calcutta.

829 B.C., Delhi—You may consult any book on plastic manufacture. Our book Plastic Industry is out of print.

830 S.N.V., Hoshangabad — Wants to be put in touch with the dealers in theatrical dresses. For books you may enquire of Thacker Spink & Co. Ltd., 3, Esplanade East and W. newman & Co. Ltd., 3 & 4, Old Court House St.; both of Calcutta.

831 P.S.D., Fulaguri—We are not aware of solvent used in fountain pen ink.

832 K.V.S., Periyapatna—Process of manufacturing potash salt will be found in a handbook of Chemistry.

834 V.A., Mathurai—Carnauba and ceresin wax may be had of Banshidhar Dutt, 126, Khengrapatty Street and Calcutta Chemical Co. Ltd., 10, Bonfield Lane; both of Calcutta.

837 V.E.W., Kasganj — Litharge and red lead may be had of Indian Red Lead Factory Ltd., 9, Netaji Subhas Road, Calcutta; B. K. Dutt & Co., 35, Netaji Subhas Road, Calcutta; D. Mullick & Co., 19, Bonfield Lane, Calcutta; Chandi Charan Nayak, 124/1, Bowbazar Street, Calcutta and B. S. Shadi & Co., Fatehpuri Street, Delhi.

839 B.C., Malta—Saltpetre may be had of Chatterjee & Dey Co., 2, Sir Hari Ram Goenka Street; Dass Dutta & Co., 3, Doyehatta Street; Khaitan Sons & Co., 2, Dalhousie Square East and Saltpetre Supply Co., 3, Doyehatta Streee; all of Calcutta.

840 C.S., Calcutta—We do not sell any article except our publications. For ink of special kind enquire of A. Chowdhuri & Co., 14, Clive Row; P. M. Bagchi & Co., 19, Gulu Ostagar Lane and Dutt & Co., 14/2, Old China Bazar St.; all of Calcutta.

841 C.V., Coimbatore—Steep the stems of cotton in water when upper layer of the bark containing fibre will soften and will be removed easily. After removing the bark this should be steeped further in water to separate the adhering impurities from the fibre. For further particulars you should negotiate with the Industries Department of Bombay Government.

846 L.S.B., Bombay—You may try the following process of stiffening collar. Collar, is impregnated with urea 10 kg., cold water 60 litre. Dissolve and mix with succinic acid 500 g.; ammonium chloride 75 g. Just before use add formaldehyde 30 litre. Impregnate; squeeze and stretch. Method of

screen printing appeared in December 1951 issue of Industry.

847 M.A.K., Bombay — Following is a formula of slate pencil: Powdered slate 60 parts; powdered limestone 30 parts; Sodium silicate 10 parts. Knead together all the ingredients to form a plastic mass and then force it through metallic tubes of suitable diameter is fitted with piston. Afterwards cut off into usual lengths and bake over a slow fire. There is nothing known as perfumed duplicator powder.

849 N.B.C., Howrah—We cannot help you in developing your land. You may however negotiate with bank for financial help.

850 H.C., Jamnagar—You may bake the fuller's earth over slow fire to remove moisture. This will be used as activated fuller's earth.

852 Y.S., Ramachandrapur — You may enquire of Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta for the book on firework manufacture. You may also consult Home Industries published from this office, price Rs. 3/12/- including postage.

853 D.C.M., Birmitrapur — We have no book dealing with chemical analysis of mustard oil.

859 G.M., Midnapur -- For the machines required enquire of Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta; Volkart Bros., 8, Netaji Subhas Road Calcutta and Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta.

861 A.S. Amritsar—We are not aware of any such chemical.

862 G.S.K., Khanapur — Articles on ceramics appeared in April 1952 issue of Industry. We have no book dealing with the manufacture of ceramics and pottery.

863 K.P., Ernakulam—For asbestos sheets enquire of Asbestos Cement Ltd., Taratolla Road, Calcutta 24; Butler & Co., 6 & 7, Netaji Subhas Road, Calcutta; William Jacks & Co., 10, Netaji Subhas Road, Calcutta; Asbestos Cement Products Marketing Co., P. O. Box 4083, Bombay and Kantilal Bhogilal & Co. 63, Nagdevi Cross Lane, Bombay 3. Buckets may be had of Bengal Bucket & Steel Works, 49 Netaji Subhas Road; Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; Dhur Galvanising Works, 92, Ultadanga Main Road and Marwari Galvanising Works, 161-1, Harrison Road; all of Calcutta. Glasswares may be had of Balsukh Glass Works, 9, Ezra Street; Imperial Glass Works, 9, Ezra St. and Krishna Silicate Glass Works Ltd., 17, Radha Bazar Street; all of Calcutta.

865 S.M.S., Nagpur—To prepare camphor cakes or tablets, moisten the camphor crystals with alcohol by spraying; then put in moulds and compress. By this means the camphor will form into blocks. On exposure to air the alcohol will volatilise leaving aside camphor in the form of blocks.

866 A.K.K., Rajkot—You may add a small quantity of zinc oxide to the soap to make it white.

867 A.E.W., Bombay—To blue gun-barrels, etc., etc., dissolve 2 parts of crystallised chloride of antimony; 1 part gallic acid, 4 or 5 parts of water; apply with a small sponge and let dry in the air. Repeat this two or three times, then wash with water, and dry. Rub with boiled linseed oil to deep in the shade. Repeat this until satisfied with the result.

868 K.N., Bombay—You may start mail order business which does not require outdoor activities.

869 P.L.J., Delhi—An article on transfer paper manufacture appeared in Fenruary, 1951, issue of Industry. For transfer paper enquire of Bengal Paper Mart, 8, Jackson Lane and Bharat Paper Syndicate Ltd., 1-2, Jackson Lane; both of Calcutta.

870 D.P.S., Kanpur—Cream separator may be had of Volkart Bros., 8, Netaji Subhas Road and Edward Keventers Ltd., 11/3, Lindsay St; both of Calcutta.

871 S.N.C.S.K.V.T., Tuni — Collapsible tubes may be had of Metal Box Co. of India Ltd., 41, Chowringhee Road, Calcutta.

872 O.S.P., Cuttack—To prepare liquid glucose moist potato starch, carefully purified from nitrogenous matter is employed. 200 parts by weight of water and as much sulphuric acid as serves to make a 0.3 per cent. solution are placed in lead-lined vessel and 100 parts by weight of starch (weighed dry) made into a milk with water are run into the boiling acid, so that the starch is almost immediately gelatinised. The mixture is then heated in a copper autoclave for one hour under 1 atmosphere pressure, so that about half of the starch is hydrolysed to dextrin and the rest to dextrose (or maltose). The process is finished when a portion gives no coloration with iodine showing that all the starch has disappeared. The product is a non-crystallisable syrup having a density of 17°Be. The sulphuric acid is neutralised with calcium carbonate, the solution filtered from the calcium sulphate through a filter press, evaporated to 32°Be in a vacuum and again filtered precipitated calcium sulphate, through a filter press, and finally decolourised by filtering through arrival charcoal, which simultaneously absorbs some of the finer particles of calcium sulphate. The syrup is now again concentrated in vacuum pans to 40°-45°Be and should be clear and colourless.

874 K.S., Amritsar—Collapsible tubes may be had of Metal Box Co. of India Ltd., 41, Chowringhee Road, Calcutta.

876 P.C.W., Guntakal — Following is a formula of pain balm: Yellow vaseline 44 parts; methyl salicylate 10 parts; cajuput oil 2 parts; menthol 2 parts; wool fat 20 parts. Mix thoroughly by trituration and put in wide mouthed bottles.

877 A.K.G., Bombay—For patent and trade mark registration write to A. Mitra & Co., 106/1/2A, Hazra Road; Dutta & Co., 82, Harrison Road and Law Morris & Co., 19, Strand Road; all of Calcutta.

878 B.K.J., Pankhai—Beedi leaves and tobacco may be had of Bhailal Bhikhabhai & Co., 99-2, Lower Chitpur Road; Manilal Anandji, 3,

Harrison Road and Hajee Latiff Abdulla, 121, 123, 125 and 130, Lower Chitpur Road; all of Calcutta.

879 G.D.K., Jabalpur—You may refer your enquiry to the Board of Apprentices Examinations, 110, Surendra Banerjee Road, Calcutta.

880 G.R.S., New Delhi — You may start manufacture of perfumes and toilet goods with Rs. 5,000/-. In this connection you may consult Indian Perfumes, Essences and Hair Oils published from this office, price Rs. 5/12/- including postage. You may also consult Manufacture of Toilet Goods by H. L. Halder published from this office, price Rs. 4/12/- including postage.

881 V.A.S., Mathurai—Carnauba wax and other waxes may be had of Banshidhar Dutt, 126, Khengrapatty Street and Calcutta Chemical Co. Ltd., 10, Bonfield Lane; both of Calcutta.

882 H.N.Y., Colombo — Following is a formula of French polish: Shellac 30 parts; gum copal 15 parts; gum arabic 1 part methylated spirit 700 parts; vermilion 5 parts. First of all pulverise the shellac, copal and gum arabic and then put into the spirit. Keep aside for 4 or 5 days stirring once a day. When dissolved strain through a cloth and keep in a well stoppered bottle.

883 A.N.K., Delhi—Following is a list of boot polish manufacturers: Bata Shoe Co. Ltd., Bata Nagar, 24-Pargs., Chemical Association (Calcutta), 55, Canning Street, Calcutta, Crown Manufatcuring House, 19, Model Basti, Delhi 6; Industrial General Products Ltd., 381, Hornby Road, Fort, Bombay 1 and N. A. Mukkhear & Co., Hing Mandi Agra. Following is a list of metal polish manufacturers: Sett & Das Co., 78-79, Beadon Street, Calcutta; Metal Polish Workshop, Sari Pati Ram, Aligarh City and Mysore Metal Polish Factory, 238, Cottonpet, Bangalore 2.

884 A.N., Secunderabad—We have no book on colour manufacture. Annual subscription of "Industry" is Rs. 10/- only. You may consult Dyestuffs and Coal-Tar Products by T. Beacall and other and Fundamental Process of Dye Chemistry by H. E. Fierz-David and L. Blangey.

885 E.T.S., Calcutta—Your name has been forwarded to "Industry Year Book and Directory" Department.

887 B. D., Jarpara — We have noted your instruction.

889 J.C.J., Forbesganj—Process of testing purity of ghee will appear in due course.

891 N.S., Berhampur — For cotton thread suitable for candles write to Hari Ram Dinanath, 160, Cross Street; K. Krishnalal & Co., 192, Cross Street and Fulchand Agarwala, 46, Cross Street; all of Calcutta.

892 D.A.N.A., Pallapatti — For standard perfumes write to F. N. Sirkar, 37, Canning St.; Ghose Bros., 50, Ezra Street and Paradise Perfumery House, 7, Colootola Street; all of Calcutta.

894 N.P.W., Nadiad—Process of manufacturing liquid glucose will be found under No. 872. We have no book dealing with manufacture of patent and proprietary medicines.

895 M.D.C., Travancore—For sajji enquire of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

897 S.Q.I., Punkunnam — Grinding stones are made with latex as the binder for the abrasive material. Carborundum grain 300 parts; rubber (from latex) 100 parts; accelerator 2 parts. Cure 2 hours at 287°F. To the latex mixture made from this formula is added a solution of zinc acetate or other coagulant, the mass is stirred until it has a cheese-like consistency. It is then moulded to shape, dried and vulcanised to the hard rubber stage. It is not possible to refill holes in grinding stone with emery powder. For emery powder enquire of A. N. Hussan Ally & Co., 28, Strand Road; A. S. Abdullabhoy & Co., 81, Netaji Subhas Road and Akbarali Esmail & Co., 30, Strand Road; all of Calcutta.

900 A.C.R., Ludhiana—For nuts enquire of Bolt Nut House, 71/A, Netaji Subhas Road, Calcutta; Alliance Engineering Works, Satragachi, Howrah; City Engineering Co., 77-3, Netaji Subhas Road, Calcutta and Coo̧mer Trading Co., 42, Strand Road, Calcutta.

901 K.L.K., Madurai—For manufacturing plastic button you have to use plastic powder and dies and machines which may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta and Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta 4. Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

904 P. P. V., Rajapalayam — The modern method of printing upon tinned plates is an application of offset printing. Detailed process will be found in September 1950 issue of "Industry."

905 S.K.G.R., Coimbatore — For slide projector enquire of Britannia Talking Machine Co. (Calcutta), 194, Dharamtala Street, Calcutta; Eastern Electric & Trading Co., 17E, Connaught Place, New Delhi; Electronics Ltd., Connaught Place, New Delhi and Friends Universal Talkie Equipment, 36, Dharamtala Street, Calcutta.

908 J.N.B., Banaras—Following is a formula of preparing solid disinfectant: Tallow 41 parts; caustic soda lye (40°Tw.) 30 parts; soda ash 10 parts, light creosote oil 8 parts, water sufficient to dissolve the soda ash. Put the tallow in a capacious pan placed over an oven. When tallow is liquefied, slowly mix the caustic soda lye, with stirring. Boil the mixture until totally saponified. Then put down the fire and allow the mass to cool a little. Next mix the light creosote oil and finally the soda ash solution. Pour the mixture in a frame and set aside for a day. Then the solid mass is taken out and cut into small cubes.

909 R.K., Delhi—Following is a formula of cold cream: Bleached beeswax 6 oz.; spermaceti 5 oz.; oil of almonds 30 oz.; borax 24 grain; distilled water 20 oz.; sandal oil 1 part; rose oil 3 parts. Melt the wax on water bath and to the melted mass add the oil and warm the mixture to 80°C. Now dissolve the borax in hot water and heat to 80°C. When the above are at 80°C, take down the wax-oil mixture from water bath, slowly stir in the borax solution and con-

tinue stirring till the mass cools to 45-40°C. Then mix the perfume and pour into containers.

910 N.K.R., Kakinada—For electrically run coffee roasting machine enquire of General Electric Co. Ltd., Magnet House, Chittaranjan Avenue, Calcutta.

911 B.N.M., Waltair—For lathe machines enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta and Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta. Ebonite rod may be had of B. M. Singh & Sons, 1, Crooked Lane, Calcutta 1; Industrial Trading Agency, 72-30, Nagdevi Cross Lane, Bombay 3 and Western India Manufacturers' Agency Ltd., 16, Apollo Street, Fort, Bombay. For irridium you may enquire of Hamilton & Co. Ltd., 8, Old Court House Street, Calcutta.

912 D.P., Nagercoil—Following is a formula of crushed orange syrup: Orange pulp 50 lbs.; sugar 50 lbs.; sodium benzoate 1½ oz.; powdered pectin 2 oz.; citric acid 4 oz.; water 1 gallon. Mix the powdered pectin with 20 lbs. of sugar. Add this to the boiling water, while stirring, then add balance of the sugar and cook to 220°F. Now add crushed orange pulp and cook to 220°F, shut off steam and add the sodium benzoate previously dissolved in 4 oz. of water. Stir around and then transfer immediately to the cooling table.

913 S.M.S.M.C., Madras—To communicate with any querist write him with number and initial care of Industry when your letter will be redirected.

914 K.R.C., Rayadrug — Process of block making will be found in Independent Careers for the Young published from this office, price Rs. 3/12/- including postage.

915 S.L., New Delhi—Following is a formula of bouquet: Benzaldehyde 1/16 dr.; rose oil 1½ dr.; lavender oil 3/16 dr. geranium oil ¾ dr.; castor tincture ⅜ dr.; vanillin tincture 1 dr.; musk tincture 1½ dr.; bergamot oil 1½ dr.; coumarin tincture 3 dr.; tuberose 1 oz.; cassie 1 oz; violet 1½ oz.; roseda 1½ oz.; rose 6 oz. and jasmine 6 oz. Mix.

916 J.K.S., Nabadwip — For securing loan you may negotiate with British India Banking Corporation Ltd., 150, Rash Behari Avenue; Calcutta Safe Deposit Co., 102A, Netaji Subhas Road and P. C. Datta (Bankers) Ltd., 32, Swallow Lane; all of Calcutta.

917 R.S., Bellary — Address of Calcutta Market is 2, Ramlochan Mullick Street, Calcutta.

918 J. T. C., Madras — Following is a formula of D. D. T. powder: D. D. T. 10 parts; pyrophyllite 90 parts. It is reported that D.D.T. with diluents prevents some difficulties. In addition to the above base, a variety of tales clays and soapstone have been used. To prepare D. D. T. solution take D. D. T. 10 parts and put it in carbontetrachloride 90 parts Shake for a few minutes and then keep aside for a few days.

919 C.M.M., Palanpur—For greeting cards enquire of Ganendra Kristo Nag & Sons, 118, 119, Old China Bazar Street, Calcutta; Jayantilal & Co., 55-181, Canning Street, Mehta Bldg. Calcutta; and M. S. Ahmed & Co. Ltd., 58-6, Canning Street, Calcutta.

922 S.N.P. Rambhar—Destilling apparatus and other equipment may be had of Adair Dutt & Co. Ltd., Stephen House, 4, Dalhousie Square, Calcutta.

924 M.N.S., Raichur—Following is the process of deodorising kerosene oil: Kerosene oil 1 gal.; Chloride of lime 3 oz.; Slaked lime 3 oz.; and put it in carbontetrachloride 90 parts. hydrochloric acid q.s. Mix the chloride of lime with the oil add hydrochloric acid until chlorine gas leaves to be given off, mixing thoroughly. Then pour on to the slaked lime contained in another vessel and allow it to remain a couple of days. Then well mix up. Allow the lime to subside and draw off the petroleum.

925 S. C. P., Cuttack — Following is a formula of chalk stick: Precipitated chalk 1 oz.; China clay 5½ oz.; Oleic acid 6⅞ oz.; Caustic soda 1 oz.; water q. s. Mix the oleic acid and caustic soda after warming them separately. Then add to the clay and chalk mixed with enough water to bring to about the consistency of putty. The mixing must be done in a standard type dough mixer or other clay mixing apparatus. Then cast into sticks of the usual size and bake over moderate heat. Raw materials may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta. Mould may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta. Following is the process of making table salt: To make table salt dissolve lump salt in four times its weight of water, filter and then drop into the filtered solution first chloride of barium and afterwards carbonate of soda as long as any precipitate falls. Then filter and evaporate the clear fluid very slowly until crystals begin to appear. When this condition has reached set aside the solution for a day. The crystals are taken out, dried and kept in bottles.

926 L.S., Arrah — Grinding wheels and other abrasive articles are made with latex as binder. Following is a typical formula: Carborandum grains 300 parts; Rubber (from latex) 100 parts; Sulphur 20 parts; Accelerator 2 parts; cure 2 hours at 287°F. To the latex mix made from this formula is added a solution of zinc acetate or other coagulant the mass being stirred until it has a cheese-like consistency. It is then moulded to shape, dried and vulcanized to the hard rubber stage.

928 K. K. T., Kathkulyan — We have no book dealing with printing press business.

930 A.B.D., Dum Dum—Distilling plant may be had of Adair Dutt & Co. Ltd., Stephen House, 4, Dalhousie Square, Calcutta.

931 P.C.S., Dharmasala — For cementing plastic articles special phenolic amounts are recommended depending on the type of plastic. With thermoplastics solvents may be used for cementing. Acetone with or without dissolved cellulose acetate has been used with success for the cementing of cellulose acetate parts. Ethyl

acetate may be used with usual success on polystyrene parts. Acryloid B-72 cement has been used satisfactorily on parts moulded from vinyl plastics moulding materials. Process of manufacturing fountain pen will be found in Mechanical Industries published from this office, price Rs. 3/12/- including postage. Wants to be put in touch with the suppliers of sheets of unbreakable glass.

933 S.B., Peddapuram — An article on cotton printing appeared in No.-December, 1953, issue of Industry. Cotton printing book published from this office is out of print.

934 A.K.M., Berhampur City—Reply to your letter has already been sent by post.

935 R.R.S., Fatehgarh—Following is the process of blueing gun barrels: To blue gun barrels etc. dissolve 2 parts of crystallised chloride of iron; 2 parts chloride of antimony 1 part gallic acid in 4 or 5 parts of water; apply with a small sponge and let dry in the air. Repeat this two or three times, then wash with water and dry. Rub with boiled linseed oil to deepen the shade. Repeat this until satisfied with the result.

937 M. S., Shoranur—For rubber latex enquire of Assam Bengal Rubber Works, New Tangra Road and Central Rubber Works Ltd., 20B, Tangra Road; Both of Calcutta.

938 G. S. A. T., Bandarawela — Journal should be published on the fixed day every month. Subject matter of the journal should be treated in a special way so that every one may be interested in it. Illustration should be given on sports and films. Manufacture of synthetic rice is still in its research stage.

940 J.R., Desar—For making yeast take one small teacupful of beer, one tablespoonful of sugar and tea-spoonful of flour are mixed together in a strong bottle and soundly corked. It is then thoroughly shaken and left in a warm place. It is ready for use when the mixture froths up on shaking generally in 24 hours.

944 S.Y.K., Dharwar—You may use carbontetrachloride as solvent for oil carbon deposited on engine parts.

945 B.M.C., Aligarh — We have no book dealing with the process of covering plastic and cotton thread over copper wire for the use of electrical fitting.

946 A.C.M.I., Jalpaiguri—For ball mills enquire of the following firms: Ashok Exporters & Importers, 23-24, Radha Bazar Street; Bery Brothers, 135, Canning Street; Bombay Company Limited, "Pollock House," 184, Brabourne Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place; all of Calcutta.

948 R.J.S., Ujjain—We have no book dealing with the manufacture of spunpipes and tiles of cement and gur and sugar. For machines and mould enquire of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road and Martin-Burn Ltd., 12, Mission Row; both of Calcutta.

951 J.M.R., Berhampur City—Your query is not in our line.

953 J.M.P., Mokameh—Following is a recipe of ring worm ointment: Vaseline 8 oz.; Hard paraffin 1½ oz; Chrysophanic acid 1½ oz.; Ichthyol 1 dr.; Oil of cinnamon 10 drops. Melt the vaseline and paraffin over a water bath and when liquid add the remaining ingredients and stir till cold.

954 U.T.C., Delhi — Collapsible tubes may be had of Metal Box Co. of India Ltd., 41, Chowringhee, Calcutta.

955 K.K.T., Gondia — For colouring horns you should first cleanse them to remove grease and other repellent substances. Then dip in a solution of Formyl Violet 3 B Ex. Conc.

959 U.B.I.P., Jamnagar—You may consult Practical Metal Casting by D. Dey published from this office, price Rs. 3/12/- including postage.

960 B.N.A., Hindupur—Transfer labels may be had of Signograph Co., Barnagore, Calcutta 36.

962 D.T.M., Mercara—For preparing hydrogen gas special kind of apparatus is required which may be had of Bengal Chemical & Pharmaceutical Works Ltd., 94, Chittaranjan Avenue and Adair Dutt & Co. Ltd., Stephen House 4, Dalhousie Square; both of Calcutta. As regards process it is very simple one which will be given by the suppliers of the apparatus.

963 A. B. F. M., Gorakpur — Camel hair belting may be had of Eastern Belting & Cotton Mills Ltd., Sheoraphully, Hooghly; Bengal Belting Works Ltd., 2, Dalhousie Square East, Calcutta and Chowdhury Belting Works, 2, Dalhousie Square, Calcutta. For vertical flour mill enquire of Balmer Lawrie & Co., Ltd., 103, Netaji Subhas Road; Francis Klein & Co. Ltd., 1, Royal Exchange Place and Kilburn & Co. Ltd., 4, Fairlie Place; all of Calcutta.

964 K.M.G., Kaligaon—For dough kneading and rolling machines enquire of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

966 S.M.Z., Trichinapalli—Following is a formula of sole paint: Venetian red 1 lb. 4 oz.; Fast brown 2 lbs. 8 oz.; Gum arabic 2 lbs. 12 oz.; Water 43 lbs. 12 oz. A mucilage is made with the gum and then using water, a paste is made with pigment, and then thinned down; using more water. Make a solution dyestuff, mix the pigment-water mixture with the mucilage then add balance of water.

967 N.C.C. Delhi—Plastic grips may be made from plastic powder with the help of a machine and special die. Machine and dies may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

968 N.C.D.C., Bhagalpur—Electrical goods may be had of the following firms: Acharya Bikaner Electric Stores, 32-2, Ezra Street; Associated Electrical Industries (India) Ltd., 6, Mission Row; British Electric Insulating Co., 4/5, Noormull Lohia Lane; Calcutta Electric Manufacturing Co. Ltd., 8, Royal Exchange Place and Eastern Engineering & Trading Co. Ltd., 54, Ezra Street; all of Calcutta.

969 K.K.S., Bhavanagar—Following is a list of weaving establishments: Ashok Weaving Works, Chovva, N. Malabar; Bal-Krishna Weaving Company, Cannanore, Malabar and Bhagavan

Weaving Factory, Hoskote, Bellary. Further addresses will be found in Industry Year Book and Directory published from this office, price Rs. 17/- *including postage*.

970 G.H., Berhampur—Process of manufacturing Ovaltine is not available.

971 M.R., Agra—You may start oil extracting ghanny or flour grinding to utilise the motor you have.

972 R.P.G., Calcutta — For hand knitting wool enquire of Bikaner Woollen Press, Industrial Area, Near Railway Station, Bikaner; Bernig Estate, Bearinag, Almora; Lakhmi Chand Kaluram, Kalimpong and Talakraj Jain & Bros., Jammu Tawi, Kashmir. Wool treating machines may be had of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta; Biscuit making machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

973 S.K.G., Rampur — Gloouie making, tablet makiing and trituration machines mav be had of Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta and Prabartak Commercial Corporation Ltd., 61, Bow Bazar Street, Calcutta.

974 B.Y., Akola—There is no arrangement for giving practical training on confectionery manufacture. As regards soap you may correspond with the Chemical Director, Industrial Research Laboratory, 22, R. G. Kar Road, Calcutta.

975 S.K.Y., Calcutta—Process of manufacturing asbestos products will appear in due course.

976 J.M., Berhampur City — We have no book dealing with manufacture of bronze statue. You have to undergo systematic practical training for making statues of bronze.

979 L.M.H., Bombay—The seeds are first parched heated or gently roasted in order to render the outer testa friable and thus facilitate its removal; the testa is then removed by a decorticating process and separated from the Kernel by winncuring or other convenient means. The decorticated kernels are either steeped or washed to remove water-soluble sugars, tannins, etc. and dried prior to grinding into flour. Now grind the seed to fine powder.

980 J. N., Puri — Chemicals for plastic manufacture may be had of Chemical Industries (India) Ltd., 18, Strand Road, Calcutta For machines enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutt.a

982 S.V.R., Madras — As stated in your letter you cannot undertake any outdoor work. You may however start mail order business with the help of one assistant who will do outdoor works such as purchasing articles from the market, mailing the goods to post office, etc. In this connection you have to print a circular letter which will be very appealing and illustrated catalogues of goods of every necessity. Now you may mail the circular letters along with catalogues. In response to your circular letter some people will place orders with you which will be executed immediately without any delay.

983 S.A.A., Sukkur — Process of manufacturing rubber baloons will be found in Manufacture of Rubber Goods published from this office, price Rs. 3-12 including postage.

984 B.B., Midnapur—Liquid glucose, cream of tartar may be had of Paradise Perfumery House, 7, Colootola Street, Calcutta. You may use ordinary *crystal* sugar available in the market. Chemicals and dyes for taral alta and writing ink may be had of Fuzzle Hussein & Bros., 44, Armenian Street, Calcutta. You should keep ink in neutral glass bottles. You may use potato starch for making office paste. Process of manufacturing starch from tamarind seed appears under No. 979.

986 S.N.V., Bulandshahar—You may start catechu manufacture with Rs. 20,000/-. For particulars regarding starting a factory you should consult a chemical engineer who will supply you with estimate and will advise you on installing machineries and equipments.

987 E.M.C., Karachi—Remove the husk from coconut and steep them in water and allow them to remain in the condition for a period of about a year i.e. till it is in a condition to be treated for the separation of the film. The water used in settling is saline.

989 J.R.C., Jharsuguda—Aromatic chemicals and perfumes may be had of Paradise Perfumery House, 7, Colootola Street, Calcutta and Ghose Bros., 50, Ezra Street, Calcutta.

990 J.P.K., Bikaner—Collapsible tubes may be had of Metal Box Co. of India Ltd., 41, Chowringhee Road, Calcutta. Chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

991 J.L.K., Ambala City—There is no such institution where training is given on safety match manufacture. For learning soap manufacture you may correspond with the Chemical Director, Industrial Research Laboratory, 22, R. G. Kar Road, Calcutta.

992 R.K.N., Surajpur—Refer your query to the Superintendent, Patetnt Office, 214, Lower Circularr Road, Calcutta. You may also negotiate with the following patent agents: Dutta & Co., 82, Harrison Road; L. S. Davar & Co., Norton Bldgs., Dalhousie Square and Remfry & Son, Stephen House, Dalhousie Square; all of Calcutta.

993 O.P.A., Mathura — We have no book dealing with manufacture of pottery. You may consult Manufacture of Pottery by Prof. H. N. Bose, Benares Hindu University, Banaras.

996 T.G.B.S., Indore City—Process of manufacturing candles will be found in Small Industries published from this office, price Rs. 2-2, including postage. Process of manufacturing fireworks will be found in Home Industries published from this office, price Rs. 3/12/- including postage. Following is a formula of chalk crayons: Precipitatetd chalk 8 oz.; China clay 5½ oz.; Oleic acid 6½ oz.; Caustic soda 1 oz.; Water q.s. Mix the oleic acid and caustic soda, after warming them separately. Then add to

the clay and chalk mixed with enough water to bring to about the consistency of putty. The mixing must be done in a standard type dough mixer or other clay mixing equipment. Then cast into sticks of the usual size and bake over moderate heat.

997 C.B., Palakol—For coir rope manufacturing machine enquire of Consul-General for Japan, 17, Old Court House Street, Calcutta.

1001 B. F. M., Trivandrum — There are several processes of bending wood. One of the simple processes is to soak the wood in boiling water for 306 hours, according to its dryness and thickness. Now bend it into required shape by straps and clamps. When got into position by force, leave it for 24 hours or longer and then keep it aside for another 48 hours before any attempt to work it. Care should be taken to compress the inner curves rather than to stretch the outer ones. The last cut from the lower end of the tree gives the least kind of wood for bending; it should be straight-grainded, young and not too fully seasoned.

1002 A.C.G., Tinsukia—Gypsum may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

1003 Q.V.M.C., Robertsonpet—Formula of an intoxicant medicine is not available.

1004 S.K.G.R., Coimbatore—For slide projector enquire of Britannia Talking Machine Co. (Calcutta), 194, Dharamtolla Street, Calcutta; General Radio & Appliances Ltd., 10, Old Court House Street, Calcutta and Photo Cine Store, 3B, Chowringhee Road, Calcutta.

1005 .R.G.R., Salem—Myrobalans are used in extracting tanning and in ink manufacture. These are exported to U. S. A., U. K., and Germany.

1006 J. B. M., Bulsar — Following is a formula of thinner: Glossy thinners 50 per cent.; Methylated spirit 20 per cent.; Toluol 20 per cent. Xylol 10 per cent. Followinig is a recipe of cellulose lacquer: Scrap celluloid 5 parts; Acetone 20 parts; Butyl acetate 15 parts; Ethyl alcohol 12 parts; Ethyl acetate 15 parts; Benzol 28 parts; Butyl phthalate 1 part; Hexalin 4 parts. Mix.

1008 K.D.S., Morvi — We have no book dealing with the manufacture of clock. Particular regarding clock manufacture is not available.

1011 S.N.R., Kadiri — Process of testing diamond will appear in due course.

1013 P.M.M., Nandura—Soap making and bakery machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

1014 L.M., Banaras—Addresses of manufacturers of celluloid rods and tubes in Japan, Germany and Australia are not available. However you may enquire of Australian Govt. Trade Commissioner, 2, Fairlie Place, Calcutta 1 and Consul-General for Japan, 19, Old Court House Street, Calcutta. Process of manufacturing fountain pens will be found in Mechanical Industries published from this office, price Rs. 3/12/- including postage. Price of Industry Year Book and Directory is Rs. 17/ including postage.

1015 K.M.G., Bombay—We have no book dealing with the manufacture of spectacle frames.

1016 G.S., Tirupati—We have no book dealing with the manufacture of sugar candy. Following is the process of manufactturing sugar candy: Sugar candy is prepared from a saturated solution of sugar formed by adding sugar to boiling water till it dissolves more. The solution is then run into troughs, in which it is allowed to cool slowly, while a number of threads are hung in the liquid upon which the crystals form and continue to grow. The time require will depend on the bulk of sugar treated. In working on a small scale it will be necessary to remove the strings and adhering crystals; then add more sugar to the liquid, and boil up, and immerse the stringe again while the liquid is cooling. Cakes of candy will also separate on the sides of the vessel in which the liquid cools.

1017 M.K..K.C., Coimbatore—We have no book dealing with the manufacturing indigenous hand fans or pankha. Hand fans of cardboard are made by hands by artisans. If you try you can make a good one seeing a fan as model.

1018 P.C., Jansath—Address of Messrs. R. V. Briggs & Co. Ltd., is 3 & 4, Garstin Place, Calcutta.

1019 M.C.I., Komarapalayam — For lace knitting machines enquire of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta.

1020 B. D. S. C., Delhi — Following is a fomula of hair dye powder: Tartaric acid (powder) 2 oz.; Barium peroxide 4 oz.; Paraphenyle medicine 2 oz. Mix the above ingredients and keep the mixture in well corked bottles This powder is to be made into a thin paste with water and applied to the hair (previously freed from oils with soap and water, and dried), by means of a sponge or brush or the fingers. Continue rubbing with it the roots of hair and pass a comb for some time occasionally adding a few drops of hot water to preserve the whole moist. Now occasionally adding a few drops of hot water to conclude by washing with soap and hot water solution.

1022 F.M.S.C., Thangadh—To communicate with any querist writte him with number and initials care of Industry when your letters will be redirected.

1023 B.P., Balangir—For catechu extracting machines enquire of Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta.

1024 E.I.G.C., Bombay—We have no book dealing with the preparation of cashewnuts. For machines enquire of Batliboi &Co., Forbes Street, Fort, Bombay and Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta.

1025 S. S. A., Bombay — Following is a formula of gasket. Asbestos on millboard is impregnated in the following: China Wood Oil

70 oz.; Linseed Oil 10 oz. Turpentine 15 oz.; Metalic resinates 1½ oz.

1026 S.M., Senchia-Ferry—It is not possible to manufacture plastic out of cassava. For a comprehensive book on poultry raising and egg production write to Thacker Spink & Co. Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta.

1029 A. H., Hyderabad—Process of manufacturing sugar candy will be found under No. 1016.

1031 S.J.O., Tirchendur—Aniline blue may be had of Champalal Agarwala, 45, Armenian Street; East India Colour Company, 34, Armenian Street and Imperial Chemical Industries (India) Ltd., 18, Strand Road; all of Calcutta.

1033 H.S.G.C., Ludhiana—Address of M. C. Mowjee & Co., is 46, Ezra Street, Calcutta. For cast iron rain water pipes enquire of Jogendra Nath Chatterjee & Sons Ltd., 21, Maharshi Debendra Road, Calcutta 7; Bengal Light Casting Co. Ltd., 21. Maharshi Debendra Road, Calcutta 7 and Kusumika Iron Works Ltd., 3, Maharshi Debendra Road, Calcutta.

1037 M. N. M., Davangere City—We have no book dealing with mulberry cultivation and silk worm rearing. For the book required enquire of the Sericulture Department of your State.

1039 T. K. P., Russelkonda — Window glasses, mirrors, frames, etc. may be had of Behary Lal Dey, 9, Swallow Lane; Bejoy Kristo Bakshi, 80, Old China Bazar Street; Chaitanya Lal Dey, 157, Lower Chitpur Road and Fotic Lal Seal & Sons, 10, Swallow Lane; all of Calcutta. Hardware may be had of Bengal Hardware & Tin Seal Mfg. Co., 70, Netaji Subhas Road; Bombay Hardware Mart, 82, Netaji Subhas Rd.; Buher & Co., 12, Netaji Subhas Road; Dutt & Co., 84A, Netaji Subhas Road and Gopal Chandra Das & Co. Ltd., 24, Raja Woodmunt Street; all of Calcutta. Perfumery and toilet goods may be had of Mira Chemical Industries Ltd., 11/A, Prince Anwar Shah Road, Tollygunge; N. Banerjee, 69/1, Manoharpukur Road; K. Hore & Co., 122, Dharamtolla Street and Himani Ltd., 29, Waterloo Street; all of Calcutta. Soap may be had of Sisir Soap Factory, 12-1, Jessore Road; North West Soap Co. Ltd., 63, Garden Reach and Nalanda Soap Works, 22, R. G. Kar Road; all of Calcutta.

1040 H.I.J., Baroda—Process of manufacturing nitric acid will be found in Chemical Industries of India published from this office, price Rs. 3/12/- including postage.

1042 B.B., Midnapur—Reply to your letter appears under No. 984 above.

1043 A.P.I.W., Nagsankar — For testing your products and chemical analysis of the same you may write to R. V. Briggs & Co. Ltd., 3 & 4, Garstin Place, Calcutta and Government Test House, Alipur, Calcutta.

1044 L.C.L., Hissar — Before using the emblic myrobalans these should be dried in the sun. Dried emblic myrobalans may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta.

1046 H.N.B., Sambalpur — Following is a recipe of pan mosala: Aniseed 2 tolas; Coriander seed 2 tolas; Cumin seed 1 tola; Seeds of cardamom *major ½ tola;* Seeds of cardamon minor ¼ tola. Bake the first three ingredients separately and then reduce them to fine powder, Also grind the cardamon seeds to powder. Lastly mix all. Following is a recipe of ink powder: Methylene blue 25 oz.; Methyl violet 5 oz.; Potassium dichromate 2 oz.; Soda ash 8 oz.; Sugar 2 oz.; Pulverise and mix.

1048 N.P., Nizamabad—Following is a formula of disinfecting fluid: Rosin 85 lbs.; Castor oil 20 lbs.; Caustic soda lye 30°Be. 60 lbs.; Light creosote oil 100 lbs. Melt the rosin, add the castor oil and when still warm add the caustic soda lye and boil thoroughly incorporated and boil the mixture till the whole is saponified. Add a quantity of water from time to time if required. Lastly dissolve the soap thus formed with 3 to 4 times its volume of water and allow to cool. When nearly cold add the creosote and stir. This gives the disinfecting fluid of good quality.

1049 S.L.V., Moradabad—Following is a formula of blue blak fountain pen ink: Tannic acid 2¼ oz.; Gallic acid 1 oz.; Ferrous sulphate 3¼ oz.; Hydrochloric acid (dilute) 2½ fl. oz.; Gum arabic 2 oz.; Carbolic acid 75 grs.; Phenol blue ½ oz.; Distilled water to make 100 oz. Dissolve the ferrous sulphate and gum arabic in about 20 oz. cold water. Add the hydrochloric acid and immediately mix the two solutions. Add the carbolic acid, phenol blue and sufficient water to produce 100 oz. Keep aside for fortnight; then filter and bottle.

1050 P.L.A., Hili—We have no book either in Bengali or in Hindi. The word should be citrus and not centrus.

1051 K.N.R.N.L., Poona — We have no book dealing with the manufacture of paints pigments and distempers. You may however consult Outlines of Paint Technology by N. Heaton and Pigments Their Manufacture and Properties by J. S. Remington. Both the books may be had of W. & G. Foyle Ltd., 119-125, Charing Cross Road, London, W. C. 2.

1052 Ch. K.M., Bikaner — Fancy glass bottles may be had of Santosh Agency Ltd., 36, Brabourne Road, Calcutta 1; Allahabad Glass Works Depot, 17, Ezra Street, Calcutta and All India Bottle Supplying Company, 153-55, Sheri Devji Street, Bombay 3. Vaseline, white oil, etc., may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, and Paradise Perfumery House, 7, Colootola Street; both of Calcutta. Labels may be had of Sikri & Co., 55, Canning Street, Calcutta.

1053 S.A.A., Sukkur—Process of manufacturing toy rubber baloon will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/12/- including postage.

1055 M.E.W.C., Bombay—Wants to be put in touch with the suppliers of python and lizard skins.

1056 M.L.K., Jamshedpur — We have no book dealing with dyeing and dry cleaning.

1059 S.L.H.P.M., Hyderabad — Following is a formula of thinner for motor enamel: Glossy thinner 50 per cent; Methylated spirit 20 per cent.; Toluol 20 per cent.; Oxylol 10 per cent. Mix. Other formulas you require will appear in due course.

1060 P.M.W., Raghunathpur—Following is a formula of agarbatti: Musk 20 gr.; Ambergris 20 gr.; Powdered benzoin 20 oz.; Powdered cinnamon 2 dr.; Powdered nitre 2 dr.; Powdered charcoal 4 oz. Make a thin paste with mucilage of tragacanth. Sticks are then made by dipping and taking out slowly thin wooden or bamboo splinters into this emulsion. Dry in the sun and store for use.

1061 B.B., Patna City—For printed saries enquire of Bhupendra Dyeing & Printing Works, 195-197, Khetwadi Main Road, Bombay; New Bombay Dyeing & Printing Works, 153-155, C.P. Tank Road, Bombay; Madura Calico Printing & Dyeing House, South Masi Street, Madura and Kanpur Dyeing & Cloth Printing Co. Ltd., P.O. Box No. 73, Kanpur.

1062 R.L.M., Basoda—For naphthalene enquire of H. Momtaz & Co., 1, Colootola Street, Calcutta. For moulds write to Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

1063 I.S.J.S., Delhi—Following is a formula of chewing gum. Balsam of tolu 2 oz.; Refined sugar 1 oz.; Oatmeal 3 oz. Soften the gum on a water bath and mix in the other ingredients, then roll in finely powdered sugar or flour to form sticks to suit.

1065 M.D.S., Shakarnagar — You may use refined castor oil and oil soluble dye for making ink for refilling pen. Formulas of hair curling lotion will be found in January 1954 issue of Industry.

1066 B.G.K. Attili—It is not possible to remove bad smell of barium sulphide. By using strong flavouring agent you may suppress the bad smell of sulphide.

1071 Z.I.C., Karachi — We have no book dealing with the manufacture of Turkey red oil and sulphonated oil.

1072 B.J.T., Surat—You have to filter spindle oil in a special kind of filtering machine for decolourising and removing bad smell of the same. Process of reclaiming used lubricating oil appeared in October 1953 issue of Industry.

1076 D.R., Saharanpur — For selling land and property you should engage local broker or you may advertise in local newspaper.

1077 A.V., Bombay — You may introduce small industries among the unemployed seamen such as manufacture of agarbatti, ink, etc.

1079 M.M.R., Vijayawada — Formulas of fireworks will be found in Home Industries published from this office, price Rs. 3/12/- including postage

1081 N.S.N., Kanpur—We have no book dealing with the manufacture of homeopathic globules and biochemic medicine.

1082 S.R.G.C., Kurseong—Dentists supplies may be had of Associated Dental & Medical Supply Co., 4-D, Madan Street, Hotel Majestic Bldgs., Calcutta 13; Bengal Dental Supply Co. Ltd., 275-4, Bowbazar Street, Calcutta and Dental Corporation of India, 121, Esplanade Road, Fort, Bombay. There is no institute where dentistry is taught by correspondence course.

1083 J. T. M., Surat— Following is a list of booksellers: Burma News Agency, P.O. Box No. 313, Fraser Street, Rangoon; Ferdousee Book Club, 247, Fraser Street, Rangoon and Manawuns Press & Medical Hall, 84th Street, Kyaukhwedan, Mandalay.

1086 L.D.C.R., Khurda—You may consult Safety Matches & Their Manufacture by K. C. Das Gupta published from this office, price Rs. 5/12/- including postage. If you go through the book you will get all the information regarding safety match manufacture. Match making machines may be had of Standard Machinery Co., 77B, Netaji Subhas Road, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

1087 D.S., Ludhiana—Chemicals for plastic industry may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta. Machines may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta.

1090 S.K.V.C., Lucknow — For jack nut machine enquire of Kilburn & Co. Ltd., 3, Fairlie Place and Francis Klein & Co. Ltd., 1, Royal Exchange Place; both of Calcutta.

1091 P.A.S., For Cochin—Talc powder may be had of Calcutta Mineral Supply Co. Ltd. 31, Jackson Lane, Calcutta. Perfumes may be had of Paradise Perfumery House, 7, Colootola St., and F. N. Sircar, 37, Canning Street; both of Calcutta.

1095 H.K.M., Hooghly—We do not undertake any publicity business. We only publish books and periodicals on commercial and technical subjects. You may however advertise in "Industry" for increasing sale of your products.

1096 S.V.S., Ambur — A good formula of disinfecting fluid appeared in December, 1953, issue of Industry.

1098 S.C.G., Mathura—Process of electroplating will appear in due course.

1101 R.M.H., Tinnevelly—For registration of cross word puzzle you may negotiate with the local Registrar's Office.

1102 K.C.K., Bombay—In place of invert sugar you may use ordinary sugar, q.s. stands for sufficient quantity as required. Alcohol 49 per cent. means alcohol containing 49 per cent. alcohol and 51 per cent. water. Pulverised sugar is powdered sugar. You cannot do without alcohol. For using alcohol for industrial purpose you may secure a licence.

1103 J.M.P., Mokameh—Following is a recipe of ringworm ointment: Salicylic acid 2 dr.; Creosote 1 fl. dr.; Resorcin 1 dr.; Benzoated lard 4 oz. Triturate the ingredients in a mortar with the lard and then pack in pots.

1104 H.M.W., Ludhiana—Following is a formula of polishing bar: Tallow 1 lb.; Red ferric exide 2 oz.; Oxalic acid 3 dr.: Pumice powder 2 oz. Powder the acid, mix with oxide and pumice powder. Then incorporate into the melted tallow. Lastly press the mixture in suitable moulds. The oxide and pumice must be quite free from grit or it may produce scratches on the surface of polished metal. Following is a process of manufacturing polishing stick to be used in finishing electroplated articles. 100 lbs. of oleo stearine and 20 lbs of double pressed stearic acid are placed in a kettle and melted by heating over 130°F. To this hot mixture add five lbs. of triethanolamine and allow the resultant mixture stand, while still hot a sufficient time for thorough commingling and to enable the chemical reaction of saponification to be completed. The above mixture is fed into a suitable mixing machine which has been previously heated, and there slowly commingled with 220 lbs. of tripoli powder and 180 lbs. of powdered flint, this mixing operation generally requiring about one and one half hours. The compound is transferred to suitable moulds in which it is allowed to solidify and harden into cakes of suitable size and shape for convenience in application to buffing wheels.

1107 K.C.K., Elamannoor—Old volumes of Industry are not available. Process of manufacturing soaps of all kinds will be found in Manufacture of Soap published from this office, price Rs. 4/12/- including postage.

1108 J.M.C., Arimpur—No such chemical is available.

1109 A.G.S., Dandaiche — For machine spare parts enquire of Volkart Bros., 8, Netaji Subhas Road; Jessop & Co. Ltd., 93, Netaji Subhas Road and Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; all of Calcutta.

1111 S., Bombay—Following is a formula of bindi powder: Gum powder 4 oz.; Magenta 1 oz. Now mix magenta or any other suitable synthetic red dyestuff. Lastly add 100 grains of boric acid.

1112 S.A.R., Ampur—Chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

1113 A.S.B., Karachi—Process of manufacturing ink tablets will be found in Manufacture of Ink published from this office, price Rs. 3/12/- including postage. Process of manufacturing soap will be found in Manufacture of Soap published from this office, price Rs. 4/12/- including postage.

1114 K.S., Nellikuppam—Your enquiry regarding impregnating varnish is receiving our attention.

1115 S.P.G., Nabha—There is no such institution where training is given on toilet goods preparaton. You may however consult Manufacture of Toilet Goods published from this office, price Rs. 4/12/- including postage. Raw materials and chemicals may be had of Paradise Perfumery House, 7. Colootola St.; F. N. Sirkar & Co.. 37, Canning Street and Ghose Bros.; 50, Ezra Street; all of Calcutta.

1119 N.K.S., Shevapet—All the ingredients you require may be had of Paradise Perfumery House, 7, Colootola Street; F. N. Sirkar & Co, 37, Canning Street and Ghose Bros. 50, Ezra Street, all of Calcutta.

1120 U.S.J., Titron—No book giving detailed process of manufacturing jute carpet is available.

1121 V.L.N.R., Madras—It is not possible to manufacture biscuits on a cottage industry basis, as it requires special kind of oven. Process of manufacturing biscuits will be found in January, 1954, issue of Industry. Detailed information however will be found in Home Industries published from this office, price Rs. 3/12/- including postage.

1124 G.B., Moradabad—Process of manufacturing blocks will be found in Independent Careers for the Young published from this office, price Rs. 3/12/- including postage. For starting block making business you have to invest at least Rs. 15,000/-. There is no institution where block making is taught.

1125 S.N.G., Delhi—Following is a formula of boot polish: Shellac wax 3 lbs.; Beeswax 1 lb.; Hard paraffin 2 lbs.; Soft soap 1 lb.; Turpentine oil 2½ gallons; Oil soluble dye 1 oz. Melt the wax over slow fire in a capacious iron pan. Next add the soap and heat to dissolve. Then slowly stir in the turpentine oil and lastly dye dissolvel in a little turpentine oil; when thoroughly mixed extinguish the fire but go on stirring until the mixture begins to thicken. At his stage pour in tins.

1126 S. J. R., Delhi — You may take up manufacture of ink, face powder, etc. on a small scale. You may consult Manufacture of Inks published from this office, price Rs. 3/12/- including postage.

1128 G. M., Warud — For cast iron and wrought iron pulleys enquire of Anand Metal & Steel Works, 61, Hastic Road, Alambazar, Dakshineswar, Near Calcutta; Bengal Iron & Steel Works, 8, Canning Street, Calcutta; Bengal Iron Works, 16-2, Chatterjeepara Lane, Bantra, Howrah; Howrah Iron Works, Howrah; Steel Corporation of Bengal Ltd., 12, Mission Row, Calcutta and Indian Iron & Steel Co. Ltd., Burnpur.

1129 W.C.C., Aligarh—Wants to be put in touch with the manufacturers of brass furniture locks and the iron fittings for doors and windows, i.e. iron black paned handles, bolts, hasps, and staples and iron hingesbutt, etc.

1130 P.C.M., Giddarbaha — Mantles are knitted from artificial silk fabric, cut into suitable lengths and stitched. These are next dipped in the following impregnating solution. Thorium nitrate 100 parts; Cerium nitrate 10 parts; Magnesium nitrate 1½ parts; Beryllium nitrate 5 parts; distilled water 2000 parts. Mix. The time of immersion of the artificial silk

mantles varies from about 2 minutes to about 13 minutets according to the nature of artificial silk.

1131 S.H.M., Amravati—You have to use a collapsible tube filling machine for filling tooth paste in collapsible tubes. Collapsible tube filling machines may be had of International Trading Co., 13, Netaji Subhas Road, Calcutta. Collapsible tubes may be had of Metal Box Co of India Ltd., 41, Chowringhee Road, Calcutta

1132 D.D.L.R., Faridabad—We have no book dealing with the manufacture of tennis balls. For tennis ball making machines enquire of Volkart Bros., 8, Netaji Subhas Road, Calcutta anl Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta.

1133 P.B.D., Calcutta—For phenol Black B enquire of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

1135 K.S., Jabalpur — Metal labels are made by means of punching and embossing machines. The process is mechanical which can be undertaken with the help of special kind of machineries.

1136 P.R.M.I., Hyderabad—Manufacturing of sewing needles has a good prospect. You may write to Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta. For safety blade making machine enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

1137 M. J. V., Mysore — Confectionery machines may be had of Small Machineries Mnfg. Co., 22, R. G. Kar Road, Calcutta.

1138 S.M.S.N.W., Sattur — You may tr tempering powder for steel in case of stainless steel.

1139 V. J. V. C., Chalakudy — Process of manufacturing ice cream will be found in Manufacture of Syrups & Cold Drinks published from this office, price Rs. 3/12/- including postage.

1141 G.M.H., Ludhiana — You may start gelatine capsule manufacturing business. For machine enquire of Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta.

1143 P.K.B., Sikandrabad—You have to buy a sewing thread ball making machine and twisted yarn from the market. After balling the thread should be sold in the market. Oil milling industry is profitable no doubt. You may also start manufacture of inks, hair oils, etc. with Rs. 5,000/-.

1144 P.N.M., Srinagar—There is no such institution where training is given on mannufacture and marketing of plastics.

1145 N.C.L., Jamshedpur—Following is a list of salt manufacturers: Bengal Salt Co. Ltd., 12, Netaji Subhas Road, Calcutta; Kartik Chandra Das Ltd., P66-4, Strand Bank Road, Calcutta; National Chemical & Salt Works (India) Ltd., 5, Commercial Bldg., Calcutta; Sumandi Salt Factory, Gopalpur, Orissa and Sundaravel Salt Companny, West Great Cotton Road, Tuticorin.

1146 R.G., Rajahmundry—Following is a formula of electric sparklers: Powdered sulphur 1 oz.; Potassium nitrate 5 oz.; powdered charcoal 1½ oz.; Iron filing 2 oz.; Aluminium powder ½ oz.; Shellacborax solution q.s. Mix the solid ingredients and then make a thick creamy consistency with sufficient shellac-borax solution (Prepared by dissolving shellac 4 parts; Borax ½ part and water 10 parts). Now dip the wires in the mixture and then insert the base of the wires in holes drilled into board, until the mixture dries. Repeat this process until each wire is covered with a thick coat.

1147 T. K. P., Ganjam — Photoframes, glasses, looking glasses, etc. may be had of Behary Lal Dey, 9, Swallow Lane, Calcutta; C. Cunniah & Co., 248/49, Devaraja Mudali Street, Madras; Fotic Lal Seal & Sons, 10, Swallow Lane, Calcutta and Abdulhusian Karimji Arsiwala, 136, Abdul Rehman Street, Bombay. Bekery powder may be had of Paradise Perfumery House, 7, Colootola Street, Calcutta.

1148 I.S.J., Agra—Weighing machine may be had of Avery Co. Ltd., Waterloo Street, Calcutta and T. E. Thomson & Co. Ltd., 9A, Esplanade East, Calcutta. For other re enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

1149 D.S., Firozabad — Process of manufacturing liquid gold will be found in July-August 1954, issue of Industry.

1151 S.K.K.N., Berhampur—You may consult Manufacture of Toilet Goods published from this office, price Rs. 4/12/- including postage. Process of manufacturing all kinds of soap will be found in Manufacture of Soap published from this office, price Rs. 4/12/- including postage. Process of manufacturing fireworks will be found in Home Industries published from this office, price Rs. 3/12/- including postage. Price of Safety Matches and Their Manufacture is Rs. 5/12/- including postage.

1152 K.D.M.C., Bellary — For stiffening collars you may try the following process: Collar is treated with the following dope: Low viscosity nitrocellose 20 lbs.; Alcohol 10 lbs.; Cellosolve 5.6 gal.; Trilolyl phosphate 17 lbs. Collar is passed through this dope and rolled up without drying. Allow to remain for one hour and dry in drying chamber; then pass through a calender. Then coat twice on each side with some dope and dry.

1159 T.D., Bombay—You should use em bellic myrobalans in making hair dyeing oil.

1160 H.B.A.M.S., Madras — Naphthalene may be had of H. Momtaz & Co., 1, Colootola St., Calcutta. For power machine for naphthalene ball manufacture write to Kilburn & Co. Ltd., 4, Fairlie Place, Calcutta.

1161 A.S.V., Madras—We have not got any book dealing with major industries of India. You may however write to the Director General of Commercial Intelligence and statistics, 1, Council House Street, Calcutta for such book.

1162 A.M.G., Dindigul—Your enquiry is not in our line.

1164 H.C.G., Katihar — Bobbin winding machine may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta and W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta. Yarn may be had of Kesoram Cotton Mills Co. Ltd., 8, Royal Exchange Place, Calcutta and Empress Mill, Nagpur. We have no book dealing with the manufacture of sewing thread.

1165 M.M.C., Aligarh—Motor handles are made of steel thickly coated with plastic.

1167 S.A.V., Nanded—Sewing thread may be had of Acme Thread Co., 37, Canning Street, Calcutta; Bengal Sewing Cotton Co., 11, Parsi Church Street, Calcutta and Chittaranjan Crochet Cotton Manufacturing Co., 37, Ghose Lane, Calcutta. For embroidery yarn you may also enquire of the above firms.

1168 A.K.D.B., Asansol — Tin pots for kimam may be had of Bengal Tin Box Mnfg. Co. Ltd., 1, Jadu Nath Mitter Street, Calcutta 4.

1169 S.T.C., Dhulia—Paraffin wax is used in manufacturing candles. Candle making machine may be had of Small Machineries Fnfg. Co. 22, R. G. Kar Road, Calcutta. Process of manufacturing candles will be found in Small Industries published from this office, price Rs. 2/- including postage.

1170 C.M., Agra—Proces of manufacturing ink will be found in Manufacture of In published from this office, price Rs. 3/12/- including postage.

1172 H.C.S., Bikaner—Following is a process of manufacturing plaster of paris: Plaster of paris is usually manufactured from gypsum For this purpose first grind gypsum into powder in a disintegrator; then pass it through 100-120 mesh screen. The fine powder thus obtained is heated to about 120°C. in an iron vessel and kept at this temperature for some time. During this period stir the material with a ladle. For zinc oxide and lithopone enquire of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

1173 S.L.G., Mathura—Nickel bath is prepared according to the following formula· Nirkel and ammonium sulphate 10 partrs; boric acid 4 parts; distilled water 175 parts. A sheet of nickel is used as an anode. To certain metals, as iron nickel and zinc metallic solutions do not readily take place, this difficulty is overcome by first coating them with copper in a bath composed as follows:—Potassium cyanide 2 parts; Copper acetate in crystals 2 parts; Sodium carbonate in crystals 2 parts; Sodium bisulphite 2 parts; water 100 parts. Moisten the copper acetate with a small quantity of water and sodium carbonate dissolved in 20 parts of water. When reaction is complete, all the copper acetate being converted into carbonate, add the sodium bisulphite, dissolved in another 20 parts of water; lastly add the potassium cyanide, dissolved in the remainder of the water. The finished product should be a colourless liquid.

1174 F.A., Secunderabad—You enquiry is receiving our attention.

1175 J.K.D., Panipat—Your enquiry is not in our line.

1176 S.R.M., Calcutta—Following is a formula of rubbing compound for auto: Tallow 10 parts; soft soap 18 parts; soft paraffin 10 parts; water 9 parts; tripoli powder 32.7 parts; hard paraffin 2 parts; Japan wax 2 parts, ammonia liquor 1/5 part; Cassie oil 1/5 part; resin 1 part; turpentine oil 10 parts; brick dust 5 parts. Melt the tallow soft and hard paraffin, resin and Japan wax over slow fire. When melted mix the soft soap and turpentine oil with stirring. Remove from the fire and incorporate the tripoli powder and brick dust. Then mix the ammonia and cassia oil. Stir for a few minutes and then put in pots.

1177 Y.B.Y., Akola—For practical training on confectionery and soap manufacture you may write to the Chemical Director, Industrial Research Laboratory, 22, R. G. Kar Road, Calcutta.

1178 V. P. S., Junagadh — Camphor is generally obtained from a species of tree found chiefly in the island of Formosa. To extract camphor the wood is cut into small pieces and boiled with water in iron vessels which are covered with large earthen domes lined with rice straw. As the water boils the camphor is volatilised along with the steam and condenses in straw. The crude product is next purified. For this purpose 100 parts of crude camphor are mixed with 2 parts each of quicklime and animal charcoal and the mixture is put in a glass vessel placed over a sandbath. The heat is then continuously applied, the camphor is sublimed off and deposited on the upper part of the vessel. When the process is complete, the vessel is removed and allowed to cool.

1179 M.B., Ludhiana—Following is a list of stationery goods dealers: A. R. Banerjee & Bros., 14/2, Old Chinabazar Street; Bose Brothers. 14/2, Old Chinabazar Street; Calcutta Stationery Emporium, 131, Radha Bazar Street; D. N. Bhattacherjee & Sons, 31, Canning Street and Dutta & Co., 7, Old Chinabazar Street; all of Calcutta.

1180 N.B., Kathmandu—In order to remove the defect of the fountain pen ink you should reduce the quantity of hydrochloric or sulphuric acid used by you.

1181 T.P.D., Ballia—Button making and tablet making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

1183 R.G.P., Junagadh—Addition of sulphuric acid will help you in making the ink waterproof.

1186 R.N., Mysore—Gunny may be had of Ashok Exportetrs & Importers, 23-24, Radhabazar Street; Tara Chand Gupta & Co., 131, Canning Street; Foolchand Sarawgie, 15, Clive Row, and Luchminarain Kanoria & Co. 133, Canning Street; all of Calcutta.

1187 M.R., Shekhupura — Cigarette paper may be had of Kishore Brothers, P23-24, Radha Babar Street, Calcutta.

1189 R.I., Dhariwal—Proces of manufacturing ink will be found in Manufacture of Ink

published from this office, price Rs. 3/12/- including postage. We have no book dealing with the manufacture of dyestuff.

1190 M.T.K., Quilon—Process of manufacturing soap and ink will be found in Small Industries published from this office, price Rs. 2/2/- including postage.

1192 H.K.C., Sabroom — Printed tin cans may be had of Bengal Tin Box Mnfg. Co., 1, Jadu Nath Mitter Lane, Calcutta 4.

1194 J.C., Kanpur — Refer your query to International Institute, Aligarh.

1195 M.A., Colombo—It is not possible to supply you all the addresses you require. You better consult Industry Year Book & Directory published from this office, price Rs. 17/- including postage.

1198 R.I.D., Jabalpur—Process of manufacturing rubber baloons will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/12/- including postage.

1199 T.C., Srikakulam — Sugar candy is prepared from a saturated solution of sugar, formed by adding sugar to boiling water till it dissolves no more. The solution is then run into troughs, in which it is allowed to cool slowly, while a number of threads are hung in the liquid upon which the crystals form and continue to grow. The time required will depend on the bulk of sugar treated. In working on a small scale, it will be necessary to remove the strings and adhering crystals; then add more sugar to the liquid, boil up and immerse the strings again while the liquid is cooling. Cakes of candy will also separate on the sides of the vessel in which the liquid cools.

1202 M. C. C., Ahmedabad—For particulars of shuttleless loom write to Disco Indusrties, New York, U. S. A.

1203 J.P., Chittor — No other addresses are available.

1204 P.O.F., Mathilakam—You should use cheap quality oil for manufacturing soaps and the process employed should be full boiling process. You may add 3 mds. sodium silicate in the soap manufactured with 1 md. of oil.

1208 S.D.E., Colombo — Following is a formula of eau-de-cologne: Bergamot oil 1 oz.; Lemon oil ½ oz.; Rosemary oil 2 dr.; Neroli oil 30 dr.; Lavender oil 4 dr.; Orange oil 2 dr.; Rectified spirit 2 lbs. Mix the ingredients with brisk shaking one by one. Set the whole aside in a stoppered vessel for 2 weeks and during that period shake the vessel thrice daily, finally filter and pack.

1209 S.M.S., Surat—If you start home industries you need not take permission of the Government, but if you start on a large scale as factory industry you should take permission of the Government.

1210 M.B.M., Mikaj — We have no other book dealing with the manufacture of fruit syrup and other fruit preparations. An article on fruit preparation appears in February 1954 issue of Industry.

1211 N.G., Moradabad—You may consult Theory and Practice of Commerce and Business Organisation by J. C. Mitra published from this office, price Rs. 14/- including postage.

1214 N.D.S., Holenarsipur—We are not aware of any such institution. You may however write to the Military Department of the Government of India.

1215 O.T.C., Bangalore — Waxes may be had of Banshidhar Dutt, 126, Khengrapatty St., and Calcutta Chemical Co. Ltd., 10, Bonfield Lane; both of Calcutta. Nigrosine may be had of Champalal Agarwala, 45, Armenian Street, Calcutta.

1216 J.D.G., Godhra—Following is a formula of luminous ink: Phosphorous ¼ dr.; Cinnamon oil ½ oz. Mix in a phial, cork tightly and heat slowly until mixed. Writing with this ink can be read in the dark.

1217 N.P., Dharmapuri—Ampoules may be had of Indian Glass Blowing & Mfg. Co., 4, Ramratan Bose Lane, Calcutta and Premier Scientific Glass Co., 26-2A, Prosanna Kumar Tagore Street, Calcutta.

1220 S. K. R., Tirunelveli—Process of manufacturing rubber stamp will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/12/- including postage.

1224 K.A.B., Wardha—For sewing machine stands enquire of Jay Engineering Works Ltd., 183A, Prince Anwarshah Road, Calcutta 31 and K. C. Mullick & Sons Ltd., 77-13, Dharamtalla Street, Calcutta.

1226 B.D.C., Kanpur — Following is a formula of rubber cements: In order to prepare this article fresh raw rubber cut in small pieces is placed in a bottle of naphtha on benzine in the proportion of 1 part of the former to 5 of the latter. The rubber gradually swells absorbing the solvent and eventually loses its tenacity. Now the mass on vigorously stirring or the bottle on shaking at a certain stage and this treatment repeated from time to time, an apparently homogeneous solution is finally obtained. This rubber solution is very sticky and tenacious. But if the raw rubber is not fresh it is better to masticate it in a kneading machine whereby it is reduced to impalpable paste. Now take 1 part of this paste and put it into 5 parts of naphtha or benzine contained in a suitable bottle. Shake for a while. The rubber readily goes into solution into a less viscous mass than untreated rubber. We have no book dealing with technology and hadicrafts in Hindi.

1227 P.S.D., Fulaguri—Address of Siemens Brother & Co. Ltd., is D3, Clive Bldgs., 8, Netaji Subhas Road, Calcutta.

1231 K.L.P., Ilayangudi — Address of the Champion Engineering Co. Ltd., is not known.

1232 U. S. S., Allahabad—You should add 25 per cent. liquid glucose along with sugar for manufacturing lemon drops. As regards use of acid you should add a very small quantity of either tartaric or citric acid. In order to make sponge rasogollas you should use fresh chhana and suji with chhana. For further particulars you may consult Manufacture of Confectioneries published from this office, price Rs. 3/12/- including postage.

1233 P.R.K.C.C., Panruti — You perhaps want rice hullers which may be had of M. N.

Mandal & Co., 67, Madhu Sudan Biswas Lane, Howrah; Machinery Supply Agency, 40, Strand Road, Calcutta and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

1234 L.C.C., Dehra Dun—For lard and tallow enquire of Calcutta Tallow Supplying Company, 19, Tiretta Bazar Street and Premier Lard Supplying Co., P43, Grey Street; both of Calcutta.

1235 J.C., Kumbakonam—Logwood extract may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcuta.

1239 N.R.B., Dhuri—Address of Consul-General for Japan is 19, Old Court House St., Calcutta; that of Consulate for Italy is 3, Raja Santosh Road, Alipore, Calcutta 27; that of Consulate-General for France is Flat 26, Park Mansions, Calcutta 16; that of Consul-General for Belgium is 24/1A, Alipore Road, Calcutta 27; that of Consulate General for Denmark is F2, Clive Buildings, Calcutta 1; that of Cosul-General for Sweden is 7, Wellesly Place, Calcutta 1; that of Consulate General for Norway is 14, Netaji Subhas Road, Calcutta 1; that of Consul-General for China is 30, Stephen Court, 18B, Park Street, Calcutta 16; that of Consul for Venezuela is 7-21, Jamir Lane, Calcutta 19 and that of Consulate General for the Union of Burma is 12, Dalhousie Square, Calcutta 1. For lottery tickets you may write to Royal Calcutta Turf Club, 11, Russell Street, Calcutta 16.

1244 G. M., Midnapore — Biri making machine may be had of J. Motibhai & Co. Ltd., 1, Rupchand Roy Street, Calcutta 7. Knitting machines may be had of Dawn & Co., 11, Portuguese Church Street; Knitting Machines Syndicate, 25-36, Waterloo Street and W. H. Brady & Co. Ltd., Mercantile Bldgs., Lall Bazar; all of Calcutta.

1245 G.S.K., Bombay—As far as we know spark plugs are not manufactured in India at present. You may advertise in newspaper offering your service regarding manufacture of spark plugs and ceramic bonded abrasives.

1252 T.S., Coimbatore — Following is the process of manufacturing camphor tablets: Moisten camphor powder or crystals with a smallest quantity of absolute alcohol and then compress into pieces of crayons in suitable mouluds. Then allow the alcohol to evaporate by keeping the crayons in a tray for a few minutes.

1253 M.A.M., Narasapur—Following is a formula of sole polish: Melt 1 part of stearin in n iron pot over slow fire; remove the pot and place it in another room or in the open air; and 4 or 5 parts of benzine; stirring vigorously. Paint the soles with this mixture and polish with a linen rag. Following is a formula of liquid boot polish: Bleached shellac 4½ lbs.; borax 1½ lbs.; soft soap 4 oz., potassium oleate 2 oz.; glycerine 1¼ oz.; industrial spirit 2 oz.; sassafras 1 oz.; furfuraldehyde 4 dr.; water 3 gals. Boil the shellac and potassium oleate and soft soap together with borax and 1 gallon of water until a clear solution is obtained. When this is quite cold stir in the remaining ingr ents. Finally add the remaining water.

1254 A.D.Q., Lyallpur — An article Modern Hair and Scalp Preparations appear January, 1954, issue of Industry. In this art you will find formulas of shampoo.

1255 L.W.C., Rajkot—It is not possibl print metal plate with printing machi Metal plates are printed by lithoprin process.

1257 O.G., Bikaner — You may negot with the following firms for tube well bori Expert Tube Well Co., 139-1, Bowbazar St and Standard Tubewell & Engineering Wc Ltd., P13, Ganesh Chandra Avenue, Calcutta.

1259 R.S., Shimoga—Refer your query Bhupendra Dyeing & Printing Works, 195- Khetwadi Main Road, Bombay and Kh Printing & Dyeing Works, 95A, Vithalbhai P, Road, Bombay.

1260 A.M., Kozhikode—As far as we kn saponin is not manufactured in India at pres Other rparticulars are not available.

1264 J M. R., Madras—Process of manu turing needles and pins will be found Mechanical Industries published from this of price Rs. 3/12/- including postage.

1266 A.M.N.M., Kollegal — Distilled wa is made by means of a distilling appara which may be had of Adair Dutt & Co. L Stephen House, Dalhousie Square, Calcutta Manufacture of Batteries is out of stock.

1267 R.S.S.B., Davangere — Tin cans n be had of Bengal Tin Box Mnfg. Co. Ltd., 1, Ja Mitter Lane, Calcutta 4 and National Sheet Metal Works Ltd., 36A, Sahitya Parishad Stre Calcutta.

1268 S.N.L.V., Kanpur — To manufact black salt mix 56 lbs. rock salt with 20 oz. dried emblic myrobalans, put ¼ of these ma rials into a round earthen pot with a narr mouth which is put in a fire place made of cl The fire place has a hole at the bottom introducing the fire wood. After the fire h been lighted about an hour, and the materi in the pot appear to be heated, the rest of the materials are added by degrees. The whole then exposed at strong red heat for about 6 hou The fire is then allowed to die away and t pot to cool which upon being broken is fou to contain about 48 lbs. black salt.

1270 A.H.S., Lucknow—Tea may be had B. K. Saha & Bros. Ltd., 5, Pollock Stre Calcutta; Bhattacharya & Company Limited, Cornwallis Street, Calcutta and Balmer Law & Co. Ltd., 103, Netaji Subhas Road, Calcutt

1273 S.S.B., Jalgaon—Process of manufa turing sticks will be found in Home Industri published from this office, price Rs. 3/1 including postage.

1274 S.D., Belagunta—We have no boo on agriculture.

1275 N.D.S., Patna — We have no oth book dealing with the manufacture of sodiu carbonate.

1276 P.S., Madura—Mohua oil is extracte from mohua seeds. Starches are white in colou Orris root may be had of Banshidhar Dutt, 12 Khengrapatty Street, Calcutta.

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